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A.A.R. Acts To

Conserve Critical Materials

Several committees have presented recommendations for substitutions to replace and measures to conserve and reclaim copper, rubber, tin and steel castings

VARIOUS committees of the Association of American Railroads have been studying for some time the possibilities in curtailing the use of critical and scarce materials such as copper, rubber, and tin and the use of substitutes for these materials wherever practicable.

From the A. A. R. Mechanical division, Committee on Brakes and Brake Equipment, a report dated January 9, 1942, covers the results of studies made by that committee in co-operation with the manufacturers of air brake equipment to develop substitutes for brass or bronze and to reduce the amount of copper used in these materials. A special joint committee from the Mechanical and the Purchases and Stores divisions reported under date of January 26, 1942, that the standard specifications for tin and sheet-metal ware have been revised to eliminate the use of tin entirely. The matter of specifications for journal bearings and journal-bearing lining to permit further reduction in the use of tin are under study and a research program has been initiated which is under the direction of the mechanical engineer of the Mechanical division and a committee representing the Committee on Car Construction, Committee on Lubrication of Cars and Locomotives and Committee on Specifications for Materials to develop substitutes for bronze in journal bearing backs and the possibility of further reduction in the use of tin in journal-bearing linings.

The Committee on Car Construction, in a report dated January 29, 1942, on the subject of substitutes for steel castings, advised that, for such important items as couplers, coupler yokes, draft gears and side frames, there is no suitable substitute available for Grade B cast steel. For other parts the committee is recommending substitutions.

A special Joint Committee on Conservation of Rubber, presents its report, dated January 26, 1942, in three exhibits. . Exhibit A lists items made of rubber or containing rubber regarding which no change in existing standard is recommended, for the present. Exhibit B is a list of items made of rubber, or containing rubber regarding which a substitute is recommended. Exhibit C is a list of items made of rubber or containing rubber regarding which a partial substitution may be made but concerning which it is necessary to conduct a further investigation before making definite recommendations.

The various committees of the Association of American Railway are continuing their studies to see if further savings or substitutes can be effected. The manufacturers of specialty devices are co-operating wholeheartedly with the committees in an effort to reduce the strategic and critical materials in their products. The individual railroads are also strongly urged to do everything possible to salvage or reclaim materials of all kinds for further use and in this way reduce the requirements for new materials. This applies to all kinds of materials in addition to the ones covered in the attached reports. It is realized that every expedient must be resorted to in order that there may be sufficient materials of all kinds available for the production of war materials even though, in so doing, the railroads may be required to use materials which may not have the same life expectancy, but which will not impair safety of operation.

Report on Brakes and Brake Equipment

The air brake manufacturers and the Committee on Brakes and Brake Equipment have under consideration the matter of substitution of various other materials for copper, brass or rubber in the construction of air-brake parts. The committee, together with the manufacturers, has carefully considered all of the items in the air-brake equipment which use copper, and submits a list of detail changes which it is felt can be accomplished without impairment of safety of operation.

It is estimated these substitutions will result in saving in brass of approximately 34.7 per cent in the brake equipment studied; or, based on total consumption during the last quarter of 1940, of a saving in copper of about 23.5 per cent for the two air-brake companies.

The manufacturers are continuing studies of other details and will submit recommendations with respect thereto to the brake committee as promptly as possible. Included in these studies will be methods for reclamation of Wabco gaskets. The air-brake companies are changing their patterns and manufacturing methods just as fast as they can to accomplish the changes recommended in the attached list.

Report on Conservation of Tin

The special Joint Committee of the Mechanical and Purchases and Stores divisions, appointed to consider curtailment and conservation of tin, has given careful consideration to the subject and offers the following recommendations:

With respect to A. A. R. standard specifications for tin and sheetmetal ware, it is recommended that all roads adopt these specifications, with substitutions, as follows:

Fig. No.	Item	Present materials	Substitute materials
2	Hand torch, upright type	Sheet steel	No change
2-A	Hand torch, teapot type	Sheet steel	No change
4	Squirt oiler, ½ pt.	Sheet steel	No change
5	Long spout valve oiler, 1 qt.	Sheet steel	No change
8	Tallow pot (valve oil can), 5 pts.	Sheet steel	No change
10	Oil carrier, 1 gal.	Sheet steel	No change
11	Oil carrier, 2 gal.	Sheet steel	No change
13	Oil carrier, 5 gal.	Sheet steel	No change
15	Boiler inspection card case	Tin	Sheet steel
16	Washout card case	Tin	Sheet steel
22	Marking pot	Tin	Sheet steel
25	Funnel, 1 qt.	Tin	Sheet steel
26	Funnel, 1 gal.	Tin	Gran. enamel or glass
28	Measure, 1 qt.	Tin	Gran. enamel or glass
30	Measure, 1 gal.	Tin	Gran. enamel or glass
31	Journal oil can, 2 gal.	Sheet steel	No change
34	Coal hod	Galv. iron	Sheet steel
36	Pail, 12 quart	Galv. iron	Gran. enamel
37	Fire pail	Galv. iron	Fibre
38	Soil can	Galv. iron	Sheet steel
38-A	Soil can	Galv. iron	Sheet steel
40	Refuse and garbage can	Galv. iron	Sheet steel

With respect to the following additional general tinware, and all other similar items formerly tinned, the Committee recommends material be used as below:

Item	Material
Oil containers and utensils	Sheet steel
Flagman's cases	Sheet steel
Drinking water field cans	Wood or fibre
Paint cans, all kinds	Sheet steel
Drinking cups	White or gran. enamel
Oil founts	Sheet steel
Hand lantern frames	Steel (paint or enamel)
Drinking-water cans	Granite enamel

It is recommended that terne plate or sheet steel be used in place of tinplate.

Check shops, enginehouses, yard buildings and supply boxes periodically for excess tinware not required for current needs and return to store stock.

The Specifications for Tin and Sheetmetal Ware should be revised in accordance with the above recommendations and the word "Tin" eliminated throughout.

Since solder is a large item in which tin is used, it is recommended that wherever possible other forms of connections be used—brazed, welded or "solderless."

Spec. M-501-38, covering lined journal bearings, last revised in 1938, for composition of lining, shows the percentage of tin to be used "as specified." It is found that many railroads are specifying tin in excess of 3 per cent, and many times considerably higher than this percentage. In order to conserve the use of tin it is recommended that the following composition of journal bearing lining be used for the present emergency:

4. Composition of Lining—

	Per Cent
Tin	1.0 to 3.0
Antimony, not less than	8.0
Tin and antimony	9.0 to 14.0
Arsenic, maximum	0.2
Copper, maximum	0.5
Sum of tin, antimony lead and arsenic, minimum	99.25
Remainder, maximum	0.75

It is the feeling of the Committee on Specifications for Materials that this will work no hardship and will not cause any particular trouble. As a matter of fact, some railroads are not specifying any tin for journal bearing linings depending on the residual tin contained in the melt of used linings, which usually produces a bearing lining having tin composition from 1 per cent to not over 3 per cent.

By following the recommended specification shown above it is felt that very little, if any, new tin will be required to be added to journal bearing lining composition for the duration of the present emergency.

Substitutes for Steel Castings

The subject of substitutes for steel castings for new equipment as well as maintaining existing equipment has been thoroughly canvassed and it is the consensus of opinion of the Committee on Car Construction that, for such important items as couplers, coupler yokes, draft gears and cast-steel side frames there is no suitable substitute available for Grade B cast steel.

The committee, as a whole, favors the present designs of cast-steel bolsters, but, in the event it is impossible to obtain bolsters in cast steel, it is recommended that consideration be given to substitutes such as built-up and welded bolsters. Several such bolsters are in existence including the built-up welded bolster of the Carnegie-Illinois Steel Company which has passed static tests and been approved for interchange service. Another type of built-up bolster has been developed by the Pullman-Standard Car Manufacturing Company, that company's drawing 518-D-20 for 50-ton capacity trucks. That company has also agreed to prepare designs for this type of bolster for 40- and 70-ton trucks.

During the present emergency it will probably be necessary to reduce the physical requirements now specified for cast steel bolsters and it is the opinion of the committee that this will be satisfactory during this War period. The matter of what reduction will be permitted is being considered by the special subcommittee on bolsters and side frames and report will be made later.

Suggestion is also made that the pressed steel bolster formerly included in the Manual of Standard and Recommended Practice be considered by this Subcommittee in connection with this matter.

In reference to miscellaneous small castings it is believed that malleable iron can be substituted for cast steel. A report on this subject was included in the 1935 report of the Committee on Car Construction.

We have, therefore, carefully reviewed this subject and the following list of parts is submitted:

Freight-Car Equipment Items for Which Malleable Iron Is Considered a Satisfactory Substitute for Cast Steel

Brake-badge plate
Brake-beam strut
Brake head
Body-side-bearing brace
Coupler carrier
Corner cap, end and side plate connection
Draft-gear cheek plates
Draft-gear carrier
Front follower blocks used with horizontal yoke attachments
Hand-brake wheel, pawl, pawl plate and ratchet wheel
Journal-box lid
Push pole pocket
Truck-side-bearing housing, anti-friction type
Uncoupling-lever brackets

NOTE.—This list is not intended to include all proprietary details which may be offered in malleable iron.

Attention is also called to the fact that drop-forged body and truck center plates have come into quite general use instead of cast-steel center plates and are preferable to malleable-iron center plates, also that built-up forged center fillers and draft lugs are in quite general use and are also preferable to malleable iron. The members are all urged to substitute other materials for cast steel except for couplers, yokes, draft gears and side frames wherever practicable.

Report on Conservation of Rubber

The special Joint Committee of the Mechanical and Purchases and Stores Divisions, Operations and Maintenance Department, Association of American Railroads, appointed to consider curtailment and conservation of rubber, has given careful consideration to the subject and offers the following recommendations:

Exhibit A—List of items made of rubber or containing rubber regarding which no change be made at present from existing standards. As materials are developed it may be possible to transfer some of these items to Exhibits B or C.

In compiling this list of items the Committee was guided by the importance of safety of operation and pre-

(*Continued on page 106*)

Karl Fritjof Nystrom, D. Eng.

Builder of the Hiawatha—Leader of men— Refuses to run in a rut

WHEN Marquette University, on June 11, 1941, conferred the degree of Doctor of Engineering, *honoris causa,* upon K. F. Nystrom, mechanical assistant to the chief operating officer of the Chicago, Milwaukee, St. Paul & Pacific, the citation included these words: "With over forty patents to his credit which have brought him outstanding, national recognition as an engineer, who is responsible for much of the development in the field of light-weight cars for railroad transportation, and has been a pioneer in the advancement of safety and comfort in modern rail transportation, and who, in particular, by his unique combination of vision, technical ability and executive leadership, has exemplified to an unusual degree the highest ideals and the finest traditions of the engineering profession."

Here is a man, born and brought up abroad, who could not even speak the English language when he came to this country at the age of 24. Today his ability as an engineer and as a railway mechanical department executive is widely recognized, and Marquette University has placed its stamp of approval upon him. What qualities does he possess that made this possible? By what path did he arrive at his present position of eminence?

Born and Educated in Sweden

First let us sketch in, in rather broad outlines and with reasonable detail, the important steps in his career.

Mr. Nystrom was born in September, 1881, in Aspa Bruk, Sweden, apparently a small iron works, for you will not find it on the ordinary map. He was thrown largely on his own resources at the age of 14, working during his school vacations and living on an extremely modest scale. He was graduated from the Mining School at Filipstad, Sweden, in 1904, as a mechanical engineer. During his college career he spent summer vacations working in machine shops in Stockholm and steel mills in other parts of the country.

There is no question about his working hard at college, for he graduated at the top of his class and was awarded a prize of 500 kroner. Nor is there any question about the fact that in order to finance his college education he had to endure hardships that would be classed as most unusual in this country. Incidentally, students in engineering colleges in Sweden are well grounded in the fundamentals of engineering. Text books were (and probably still are) expensive and rather scarce, as compared to this country. The lecture system was therefore resorted to more extensively. Possibly this accounts for a more thorough basic engineering training, in some respects at least, as compared to places where text books are more plentiful, and therefore not so highly regarded.

Came to This Country at 24

After graduation he went to Germany to study high tensile steel, but soon decided to follow up his studies in this country. He arrived in 1905, with practically no knowledge of the English language, and was immediately attracted to Pittsburgh, the center of the steel industry.

Mastering the English language and getting started in industry was no easy task. He worked as a blueprint boy and then as an engineer, for the Midland Steel Company, and then took a job with the American Steel & Wire Company, still at a bare subsistence wage. Overwork made him an easy target in a typhoid epidemic and for months he was confined to a general ward of the Pittsburgh Hospital. Recovering, he became a draftsman for the Pressed Steel Car Company, but in 1909 was engaged for a few months as a member of the engineering staff of the Pullman Company. He then went with the Southern Pacific during the electrification of its Oakland—Alameda interurban line and designed and supervised the construction of the first electric interurban cars for that service. Following this, in 1911, he was made assistant mechanical engineer of the American Car & Foundry Company. He was mechanical engineer of the Acme Supply Company in 1912-13 and by that time was well launched on his career.

This is the last of three more or less intimate stories about railway mechanical department officers who last June were honored with Doctor's degrees by American colleges and universities. They answer quite conclusively the question as to why it was that these men were so honored. A biographical sketch of George McCormack, general superintendent motive power of the Southern Pacific Company, appeared in our January number; a similar story about Frederick W. Hankins assistant vice-president of the Pennsylvania Railroad was published in the February issue.

Karl F. Nystrom

Becomes a Real Railroader

In 1913 he became chief draftsman of the car department of the Grand Trunk, now the Canadian National. He accepted a similar position with the Canadian Pacific in 1918, but in 1920 returned to the Grand Trunk as engineer of car construction.

In 1922 he was appointed engineer of car design, Chicago, Milwaukee, St. Paul & Pacific. He has remained with that road, being promoted to engineer of motive power and rolling stock in 1925; functioning as master car builder from July to September, 1927; and then becoming superintendent of the car department. In 1937 he was promoted to his present position of mechanical assistant to the chief operating officer with general supervision of the car department, and in addition supervision of engineering, designing, construction and co-ordination of facilities in the mechanical department. On September 1, 1941, his jurisdiction was extended to include all branches of the mechanical department.

Builder of the Hiawatha

The early part of Mr. Nystrom's career, and until he became a master car builder 14 years ago, was almost entirely in the field of freight and passenger car design. When he became an executive in the car department his active and ingenious mind continued to be intrigued by the problems involved in still further improving the design, construction and operation of such equipment. Nothing has been too revolutionary for his consideration; nor has he allowed his vision or thinking to be hampered by conforming to ordinary practices or by running in a rut.

Mr. Nystrom astonished the railroad world when in 1934 he designed and started to build in the railroad's shops at Milwaukee all-welded steel coaches,[1] which were a distinct departure from ordinary car building practices and provided comforts and even luxuries not ordinarily available on coach equipment at that time. By welding the structure,[2] rather than riveting it, and through other devices, the weight of the cars was reduced from 31 to 33 per cent, thus effecting substantial economies in operating costs, as well as facilitating the maintenance of higher train speeds.

Not many months after the first of these cars was constructed the streamlined, high-speed steam locomotives built by the American Locomotive Company made it possible on May 29, 1935, to place the famous Hiawatha trains in regular service between Chicago and the Twin Cities.

Not only did the railroad design the cars, but the entire technique of building them had to be developed, in order successfully to manufacture them in its shops. Mr. Nystrom, for instance, called on all the available talent in the field of electrical welding. There were wide disagreements among the experts, however, and in the last analysis it was necessary to go forward boldly and largely on his own initiative to develop the facilities for the successful fabrication of this equipment. More than this, it was necessary to assemble and train a considerable force of welders. As is always true in pioneering into new fields, errors were made, but this only challenged a greater ingenuity and a larger effort on the part of Mr. Nystrom and his staff.

From that day to this, steady improvement has been made not alone in the processes of building the equipment, but in its design and construction as well. One of the first steps in the further improvement program of the Hiawatha equipment was the use in the second, or 1936 design[3] of light-weight, high-tensile steel, and the introduction of other light-weight materials. This made possible a further saving of 10 per cent in the weight of the new cars, over the first all-welded ones; they were thus more than 40 per cent lighter than the conventional steel passenger cars.

While on the third, or 1938 Hiawatha design[4] few changes were made in the details of construction, many improvements were introduced to insure greater ease and comfort to the passengers.

Just as remarkable as the improvement in the design of the body of the cars has been the steady and continued development of the trucks; here, too, the beaten track has been departed from and new and novel features have been introduced, which have greatly improved the riding qualities at the high speeds at which this equipment is operated. From the very first the Hiawathas have been notable because of their easy riding qualities, but today they stand unexcelled in this respect.

Mr. Nystrom's thoroughness and scientific approach to such problems are well illustrated by the experimental procedure followed in developing and improving passenger car trucks. Instruments were placed in different parts of the car to record the vertical oscillations, as well as the lateral movements. Other instruments giving similar information were placed on the truck. One of the platform steps was removed and a well installed in its place, with a window facing the truck; through it all movements of the truck could be observed. Motion pictures were also taken through this window while the train was running at various speeds and in different localities. Similar pictures were taken after each change of design. A comparison of these pictures projected upon a screen made it possible to check critically and in detail the effect of the changes or modifications. As one of Mr. Nystrom's associates remarked: "Needless to say he was present at all these trials."

The Lowly Box Car

The lowly box car does not rate so highly in the public eye as does passenger equipment, and yet the improvement of freight car design on the Milwaukee, under Mr. Nystrom's direction, has been quite as radical, though less spectacular, as the change from the standard coach equipment to the modern light-weight, streamlined designs. The latest development in this respect was the completion of the 500 fifty-ton, all-welded box cars[5] constructed of high tensile steels, at the Milwaukee, Wis., shops; these embody a number of unusual features. With a light weight of 48,200 lb., the cars have a capacity of 5,157 cu. ft.

These radical innovations in the passenger and freight equipment are typical of the approach which has been made under Mr. Nystrom's guidance to all phases of mechanical department operations and activities. Certain important considerations should not be overlooked, however. "In the face of many new and radical changes," reports one of his technical associates, "he has always insisted that the design must be practical, and above everything else, safe. He is a master of detail, and follows a project through to conclusion, from the time it appears on the drawing board to the finished article. In addition, he follows each move in the fabrication, suggesting ideas for the many dies and jigs, and the routine progress of each operation through the shop. He often comes back to the shop when most of us are asleep. He is full of ideas, but will graciously withdraw any if it can be proven to him they are not entirely safe."

[1] *Railway Mechanical Engineer*, October, 1934, page 361.
[2] *Railway Mechanical Engineer*, December, 1934, page 444.
[3] *Railway Mechanical Engineer*, November, 1936, page 467.
[4] *Railway Mechanical Engineer*, March, 1939, page 95.
[5] *Railway Mechanical Engineer*, December, 1941, page 508.

Car Department staff meeting, May 20, 1932

Related Activities

As already noted, the greater part of Mr. Nystrom's career, until more recent years, has been concerned with the car department. Naturally he has taken an active part in railroad associations interested in its activities, and car department officers have been appreciative of his assistance and co-operation in that respect. One evidence of this was the presentation to him in November, 1938, by the Car Department Association of St. Louis, of a bronze plaque containing this inscription: "For his outstanding contribution to the science and art of design and maintenance of railway rolling stock."

In 1930 Mr. Nystrom was elected president of what was then known as the Master Car Builders' and Supervisors' Association. Hard hit by the depression, it was forced to lie dormant for seven long years. Its president, however, was not unmindful of his responsibilities. He was constantly on the alert to take advantage of any opportunity to restore the association. When it held its next meeting in the fall of 1937 it was naturally smaller in size, but it had a new constitution to provide for the changed conditions, and adopted a new name—the Car Department Officers' Association—which was much more expressive of its real status. When Mr. Nystrom laid down his office at the convention in 1938 the association was in a most thriving condition.

He has not always seen eye-to-eye with committees of the Association of American Railroads. He was a member of its car construction committee for several years, and his novel and original ideas stirred up lively discussions. His road is now represented on that committee by his engineer of car construction. While sometimes at variance with A. A. R. committees he has always been generous in supplying them with information, or in assisting them in other ways.

He has been a member of the American Society of Mechanical Engineers since 1921, taking an active part in the Railroad Division of the Society; recently he was chosen a member of the executive committee of that Division.

Interested in Engineering Education

Mr. Nystrom has a keen appreciation of the importance of education and training on the job. He is also, however, greatly interested in more formal education, particularly in the field of engineering. Marquette, a Catholic university, is located at Milwaukee, which also is the home of the great shops of the C. M. St. P. & P. The university has a small, but excellent, engineering college, which is conducted on the co-operative plan, i.e., the students spend part of their time in industry while attending college, and the theoretical training and practical experience are co-ordinated. The student thus has a keener appreciation of the importance of his college work, and when graduated has a sufficient experience in industrial practices to get him off to a good running start in his profession.

Mr. Nystrom is not a Catholic and his broad-mindedness is indicated by the fine way in which he has co-operated as a member of the Board of Supervisors of the College of Engineering of that institution. His active assistance has extended not alone to the forwarding of the co-operative feature of the engineering training, but into all phases of its program, and notably into the planning and arranging of more adequate physical facilities. The awarding of his degree coincided, in fact, with the opening of the new engineering building.

Mr. Nystrom is a believer in small engineering colleges; the student body in that college of Marquette University is in the neighborhood of 500. While he places strong emphasis upon thorough training in fundamentals, he is not unmindful of the importance to an engineer of a broader cultural training and an appreciation of good citizenship.

As An Executive

Mr. Nystrom's career and achievements, as they have been thus far presented, have had little if any reference to those things that set him apart, not as an inventor or designer and builder of equipment, but as a successful executive and leader of men.

When he was appointed to the position of superintendent of the car department, it was predicted by some that he would make a mess of things. It was pointed out that he was a highly technical man and that he would be unable to deal successfully with car foremen and car inspectors who are practical men interested in maintenance and do not have an engineering background. His critics overlooked the fact that a technically trained man in such a position, with a "sprinkling of horse sense" should, in general, do a better job than the man without an engineering training.

He went at the broader task in a most sensible and direct way. His work as a successful designer had naturally brought him in contact with car maintenance problems. He recognized his lack of experience in doing strictly maintenance work, however, and started to meet frequently and regularly with the car foremen—a practice he has never discontinued. The foremen were encouraged to make suggestions for more efficient and more economical operation. Keenly observant, ingenious and open-minded, Mr. Nystrom saw ways in which he believed current methods and practices could be im-

proved. He discussed these freely and frankly at the meetings. No changes were made unless the group so voted. If objections were offered to the suggestions, he took them under further advisement and brought them up at later meetings; sometimes modified plans were eventually adopted.

It all resulted, however, in making the foreman more alert and more expert, and it developed methods and practices which have made possible more economic and effective maintenance. As a result of this procedure, for instance, all passenger car repairs are now concentrated at the Milwaukee shops rather than being done at seven points on the railroad. Heavy repairs to freight cars, formerly done at eleven points, are now concentrated at four points.

Teacher — and Leader

One who is close to him and his organization, and sees him "with his hair down," so to speak, characterizes Mr. Nystrom as a "master of organization, who does not drive but leads." This is well illustrated by the infinite pains he takes to "sell" ideas to his subordinates. He realizes that if men are to do their best work, they must put their whole heart into it—that they must be enthusiastic! He will not tolerate "yes" men. Obviously that means that his associates must be fully and intelligently informed. He has always been handy with his sketch pad, and with a few colored pencils, which he keeps handy, he has the faculty of visualizing his ideas in a clear and striking manner.

But those who are closest to him have noticed also an interesting tendency in more recent years. To drive home his points, and to dramatize their meaning, he has resorted more and more to the utilization of strategy adopted by master teachers—to speak in parables; simple ones if you will (the simpler the better), and frequently to season them with humor. Obviously such a man must be endowed with a patient and charitable disposition, and so he is.

On the other hand, once having made up his mind he drives forward with full vigor and a remarkable persistence. There is no such a word as "no" in his vocabulary, once the die is cast. And because his associates recognize this they play the game with a zest, and by ingenuity and strategy overcome what might otherwise seem to be insurmountable obstacles. They realize this also—the boss will never let them down, or out in the cold. They may make mistakes or errors of judgment, but if they have done their best they can rest assured that he will stand back of them. There is no carping criticism, but rather a broad tolerance which does not overlook mistakes but rather tries to capitalize upon them. When a mistake is made, the question is not so much "What has it cost us?" but "What can we do to take advantage of it and capitalize upon it?"

His Labor Policies

From what has already been said, it must be apparent that Mr. Nystrom's department is not hampered by labor difficulties. He has done everything he could to stabilize employment, and the men and their leaders understand and appreciate this. He has shown a keen interest in the welfare of the employees, collectively and individually, and has attacked the safety problem not in the spirit of "accidents must be stopped," but rather in an intelligent and almost prayerful attitude in the effort to secure the co-operation of every employee in eliminating sources of accident.

In speaking of his men he is quite likely to refer to them as "My Boys." This is not in a paternalistic attitude, however, but rather in the spirit of one who is proud to be associated with his co-workers.

Possibly the observations of a labor representative may give a more intimate picture of Mr. Nystrom's handling

Mr. Nystrom (second from left) worked in a small mill in Sweden during one of his college vacations—Genuine Swedish wrought iron was fabricated—Because of extreme heat in the mill, the clothing consisted of nothing but a long shirt made of rather heavy canvas duck, woolen socks, and homemade wooden shoes

of labor relations. "The nature of the propositions I have to take up with him," says this representative, "as you may well know, are not always such that he can give his full approval, but his keen understanding of the employees' problems makes for his sympathetic consideration, and his decisions once given are always carried out. Two of his outstanding characteristics are sincerity and integrity, and such being the case the representatives of labor, who deal with him, and the employees in the shops have confidence in him. He is accessible at all times when an appointment has been made, and his conversation and discussion is easy, refined and sincere, never boisterous and at no time does he stoop to vulgarity.

Commencement Day at Marquette—Left to right: Karl F. Nystrom, Doctor of Engineering; Dr. Rock Sleyster, Doctor of Laws; John G. Gregory, distinctive civic service award; Rev. Raphael C. McCarthy, S. J., university president; Capt. William F. Amsden, U. S. N., naval reserve director of the Ninth Naval District

"It has been a source of great satisfaction and pride to the labor representatives who have dealt with him these many years, that every situation that has arisen and needed adjudication has been disposed of without a single dispute ever having been submitted to the Railroad Adjustment Board for a decision."

Digging still further into the background, we find that Mr. Nystrom has taken great pains to keep the representatives of labor fully informed as to the problems with which the railroads, his railroad, and his particular department are confronted. He has talked these matters over with them frankly and has supplied them with accurate and ample facts and figures.

A striking instance of a direct appeal to the workers was that made in 1934 when the first welded steel passenger cars were being built. It was quite generally conceded that the railroad company's shops were not organized or equipped to undertake such a program. Difficulties were encountered from the outstart and it looked as if the time schedule could not be met and that the expenses could not be controlled and kept within the estimates, on the basis of which it had been decided to do the work in the company shops. A mass meeting was called of all the men in the shop. Mr. Nystrom explained the situation to them and appealed to them for support. As a result the cars were delivered exactly on the date promised and enough money was saved to purchase the first two Hiawatha locomotives and air-condition 30 passenger cars.

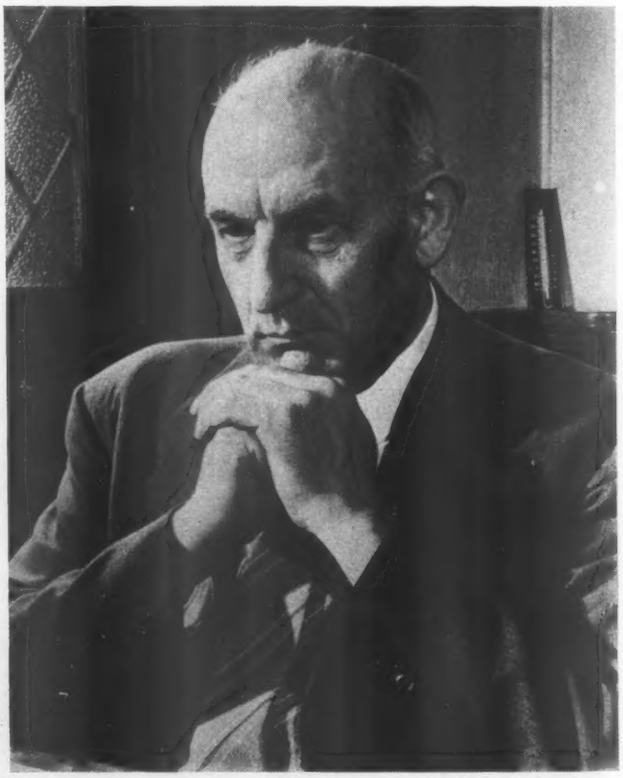
One of the general chairman makes this additional comment: "He has no favorites among his supervisors and merit and fitness are qualifications for promotion and assignments." He might have added, if it had occurred to him, that Mr. Nystrom has never gone outside the organization for supervisors; he finds them on the inside. The inference is, of course, that he trains and develops them.

Intimate Side Lights

A psychologist must surely be intrigued by Mr. Nystrom's personality. Gustave Pabst, Jr., financial editor of the Milwaukee Journal, pointed out that he had "built his ladder of life on three ideas"—self-reliance, never look at a clock, and work twice as hard as the other fellow. His close associates comment on his courage, his persistence, the fact that he looks to the future, decides on his goal or objective, and then strives unceasingly to attain it.

Contrast this then with the other side of his nature. He is "modest and self-effacing," says an intimate; "kindly and charitable," says another. It is pointed out that "one quality of his which has impressed me is the unassuming attitude which characterizes him. He has the humility that is found in really great men." Or, says another, "in times of grief or trouble he is found to be the first to aid those under him."

Do we find here a rare combination that helps to make for leadership? An associate who has worked at his elbow for two decades sums up his personality in these words: "He has the knack of getting what he wants done without in any way being a driver."



Thinking a problem through

He is keenly interested in people, and especially in the younger ones. He does not talk about it but his intimate associates know what he has done, sometimes without being known in the transactions, to assist in the

(*Continued on page 105*)

Great Northern Cabooses

Heavy wood superstructure is built on reclaimed steel underframe — Sharp corners and projections carefully avoided on the interior

In order to meet adequately exacting service requirements in connection with fast, heavy, long-haul freight train operation, the Great Northern has built at the company shops, St. Cloud, Minn., a lot of 20 cabooses. These are of unusual interest as they include many special features developed to assure increased safety, comfort, and convenience for train crews. They operate through from Twin Cities to Puget Sound terminals, thus eliminating loss of time incidental to frequent caboose changes en route. The number of caboose cars required to cover these runs is also reduced.

The trucks are Bettendorf caboose-type with one-wear wrought-steel wheels, journals 4¼ in. by 8 in., No. 15 brake beams with Creco third-point supports, Miner roller side bearings, etc. The underframe is of exceptionally rugged construction designed to afford adequate protection in the heaviest pusher service and at the same time permit the utilization of second-hand materials, thus reducing the drain on structurals needed for other purposes and effecting a considerable saving in cost.

There were available "basket-type" steel underframes recovered from retired 40-ft. 40-ton box cars, consisting mainly of a pair of 10-in. 35-lb. channels with full ⅜-in. top cover plate, cast-steel body bolsters, metal crossties and end sills, A.A.R. friction draft gears and 6-in. by 8-in. couplers. These underframes, being only 10 years old, evidenced little if any corrosion, and the steel was practically the equivalent of new material.

Much ingenuity was used in adapting this underframe to cabooses. In order to give the extra distance from end to body bolster to accommodate steps and platforms, the rivets securing the bolsters to the center sills were removed; the bolsters were jacked back 18¾ in. and reriveted in the new position. Since the center sills were about 4 ft. too long a section was cut away near the center. Two additional 10-in. 35-lb. channels, long enough to reach from back stop to back stop, were placed between and back-to-back to the center sills. The original sills were then weld-spliced and the entire assembly riveted together; the ends of the auxiliary channels were welded to the rear back stops to eliminate any possible hinge action at that point. A ½-in arched auxiliary top cover plate, extending from the platform to back of the draft stops, was applied to protect against any possible buckling in that region. The original channel end sills, strikers, draft stops, etc., were not disturbed. Side sills and body end sills are 10-in. channels. The entire underframe assembly was secured by welding and riveting, thus making an underframe structure much stronger than that of a modern box car and giving increased protection to train crews.

Special friction draft gears, having a high capacity ultimate but possessing a soft action through the first half travel, were selected as being best suited for cabooses. Couplers are 6¼-in. by 8-in. Type-E, bottom-lift, with A. A. R. cast-steel yokes. Brake equipment is K2, with a Universal horizontal-wheel power hand brake at each end of each car. Combined conductor's valve and back-up whistles are mounted on platform railings near the hand brakes; an air gage and a conductor's valve are installed in the cupola. A bleed cut-out cock is placed just back of the angle cock as a safety measure when a pusher locomotive is cut off.

Reinforced Wood Construction in the Superstructure

The superstructure is of heavy wood construction substantially reinforced with steel. Corner and end posts are made particularly strong as a protection against possible telescoping. Malleable pockets were used on side posts and braces. Roof framing is of Z-bar construction. Cupola framing is built into the body framing in such a manner as to preclude weave between the two. The floor construction consists of a $^{25}/_{32}$-in. T. & G. subfloor, covered underneath with second-hand galvanized iron as a protection against weather and sparks. On the subfloor is placed a layer of waterproof paper, 2 in. of Stonefelt and another layer of waterproof paper. An air space is allowed and the 1¾-in. T. & G. main floor laid. This is covered with another layer of waterproof paper and

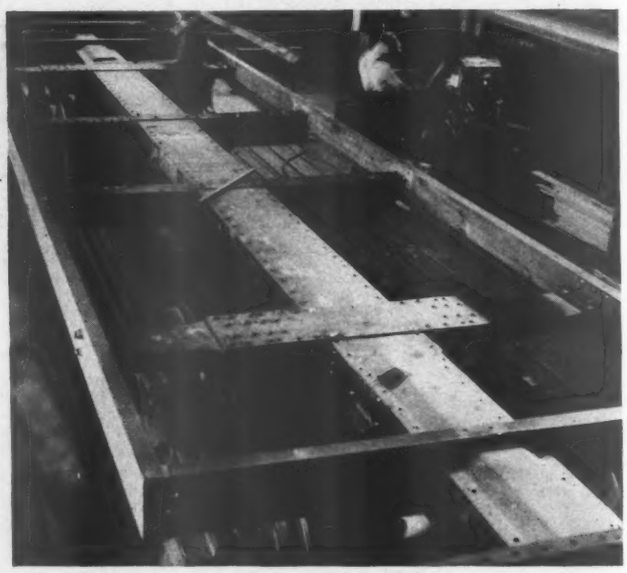
The wood superstructure frame, reinforced with steel at corner and end posts

the finish floor, of $^{25}/_{32}$-in. by 3¼-in. lumber, applied.

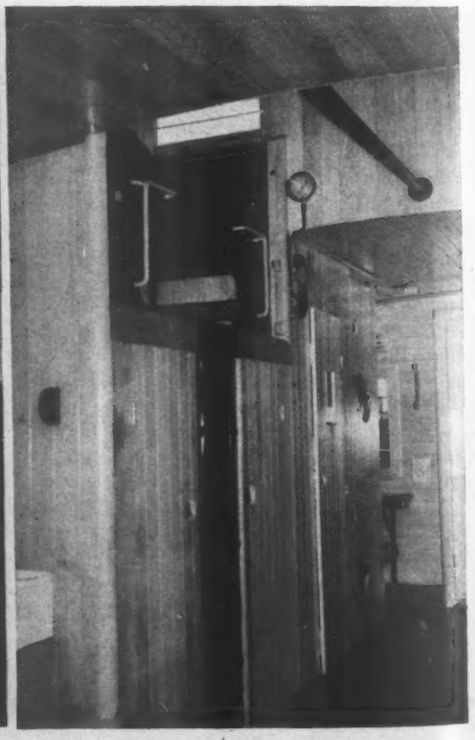
The roof construction consists of special $^{25}/_{32}$-in. by 3¼-in. ceiling, waterproof paper, 2 in. of Stonefelt, another layer of paper, an air space, $^{25}/_{32}$-in. roof boards, covered with Mulehide canvas roofing and coated with Texas car cement. The side and end walls consist of $^{25}/_{32}$-in. by 3¼-in. sheathing, waterproof paper, ¾-in. Insulite board, air space, ¾-in. Insulite board, another air space, waterproof paper and special $^{25}/_{32}$-in. inside finish. This extra insulation was considered desirable in view of severe climatic conditions, both winter and summer, to which these cars are subjected.

The caboose steps are metal and the treads, as well as platform floors, are of open-work spot-welded steel. The outer edge of treads is tubular and the lower tread is in line with the outside of the body sheathing and 16 in. above the top of the rail. The platform end sill extends 2 in. above the floor; the platform railing consists of 1¼-in. pipe, bent to shape and securely fastened to the platform end sill channel. Instead of the chain ordinarily used across the platform opening, a gate, of bent pipe, is installed. The railing is above the height in general use, and the platform is further protected by splash

(*Continued on page 105*)



The steel underframe as substantially strengthened and rebuilt for caboose car service



Left: The stove and other equipment installed at one end of the car—Right: At the cupola corners are rounded and projections recessed

M. B. M. A. Report on

Application of Rivets*

THE use of large boilers and the consequent increase in total evaporation has aggravated troubles occasioned by encrustation and expedited the adoption of means for improving boiler water conditions which, in certain sections of the country, has been followed by "inter-crystalline corrosion," a term descriptive of the condition which develops in steel when subjected to high stresses in the presence of sodium hydroxide. The fact that these stresses are influenced by any factor producing a load on the rivets has led to a study of means for reducing rivet stresses regardless of the manner in which such stresses are produced; that is, whether directly by the normal stresses in the joint resulting from pressure or indirectly by stresses introduced in the rivets by driving at excessively high pressure or otherwise. This, in turn, led to consideration of all of the factors tending to increase the load on rivets beyond that produced by steam pressures and boiler design. It was not until much study had been given to the matter of intercrystalline

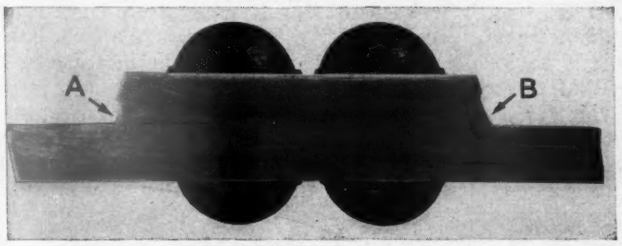


Fig. 1

corrosion that the possibility of introducing conditions favorable to this development through excessive rivet driving pressures became a subject of importance in boiler fabrication.

The studies to which reference is made have led to definite conclusions which may be grouped under the following headings, under which appear corresponding discussions:

Assembling of Plates

Stresses upon rivets in horizontal seams may be greatly minimized through the proper preparation of the seams through which the rivets are finally driven. This requires that the longitudinal courses be so formed that the sections of the plates which are to be joined shall have the same radius as that to which the course itself is to be made. This requires either that the adjoining edges shall be pressed to the proper radius or that the course be rolled and the flat portions of the adjoining plates discarded. Either of these procedures, if properly performed, will produce the desired results, although it is obvious that the use of the pressed edges will involve the least expense. The outside and inside welt straps should likewise be accurately formed in dies having the proper radii.

The subject of boiler fabrication has been covered in a report (Topic No. 5—Application of Iron, Steel and Alloy Rivets) made to the association in 1940. The following revisions and additions, however, are suggested in order more completely to insure accuracy in the preparation of the plates for rivet application; to insure that the plates are drawn metal to metal and that the rivets are not over stressed but are tight enough to avoid seepage through the rivets and joints. This is necessary in order to avoid the intercrystalline corrosion of the metal in both the rivets and the plates. In lieu of the paragraph (fourth paragraph, page 74, 1940 Proceedings) relating to the application of temporary bolts in the circumferential and horizontal seams, substitute the following:

Assemble shell courses by heating one course at the girth seam and then entering the unheated courses into the heated one. It is suggested that the allowable shrinkage be established at a maximum of 3/16 in. and a minimum of 1/8 in., measured on the

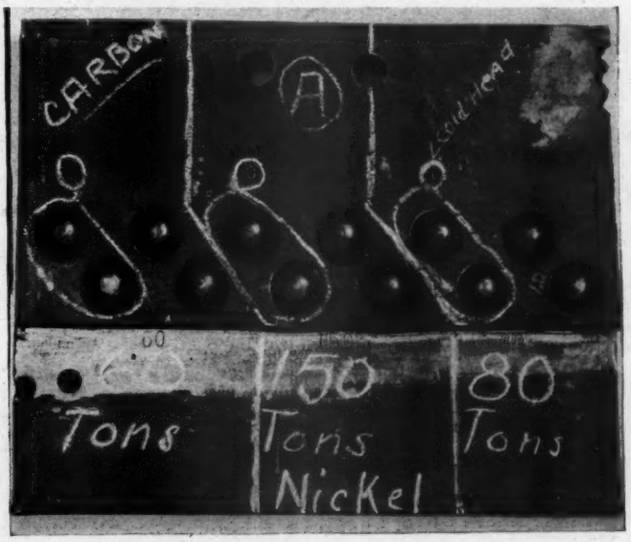


Fig. 2

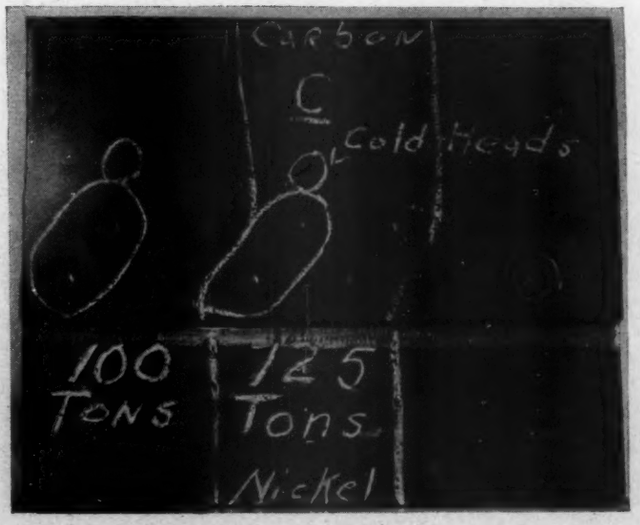


Fig. 3

* Abstract of a report presented at the annual meeting of the Master Boiler Makers Association, Chicago, September 23 and 24, 1941.

outer circumference of the course which is to be telescoped. Care should be exercised in the assembly to avoid the setting up of stresses.

Boiler-shell courses are required to be bolted together first at quarter, then at eighth, and so on in sequence of holes opposite one another, and when riveting the same procedure should be followed. In this procedure the temporary bolts should be placed in every other hole.

It is also suggested that the following requirements be added to the portion of the 1940 report covering fabrication which relates to longitudinal seams:

Longitudinal shell-course seams which are designed with inside and outside welt straps, multiple riveted, shall have the welt straps and rivets caulked inside and outside. Inner welt straps of longitudinal shell-course seams shall be scalloped to facilitate caulking.

Flanging of tapered courses on a bull machine to make them fit other courses, or drawing up plates on the bull machine will not be permitted.

Eccentricity of the shell courses should be kept to a minimum and, when finally assembled and riveted, they should not exceed ¼ in.

In its 1940 report on Topic No. 5, the committee illustrated certain tools suggested for caulking operations, which included a fuller caulking tool as well as a combined square and fuller type. Experiments made under the supervision of the secretary-treasurer indicate that the influence of the fuller type of tool may cause a separation of the plates back of the caulking edges. The original specimen of the plates used in these experiments were 36 in. long and the rivets were driven at a pressure of 90 tons on a hydraulic bull riveter, the plates originally having been metal to metal which was the condition after the rivets had been driven and before any caulking had been performed. A fuller caulking tool was used on one side of the plate and a combination square and fuller caulking tool on the other side, both sides being heavily caulked to determine what results would be obtained. The condition resulting from the use of the fuller caulking tool only appears at *A* in Fig. 1, which clearly shows the separation occurring between the plates. A similar condition using a combination tool appears at *B* in Fig. 1, which shows no separation between the plates.

Since the avoidance of conditions contributing to intercrystalline corrosion is now an important factor in boiler construction, it is important that the plates remain in contact. This is evidently prevented by the use of a fuller caulking tool.

Since the publication of the 1940 reports, the Committee on Specifications for Materials, A. A. R. Mechanical Division has submitted recommendation covering specifications for rivet steel and rivets, applicable, however, only to carbon steel. In the interest of standardization, this committee suggests that favorable consideration be given to the adoption of these specifications which cover tolerances for both rivets and rivet heads. Where it is desired that any modifications in these standards be proposed, the secretary of the Master Boiler Makers' Association should be advised, details of the proposed changes being furnished with the reasons therefor.

Heating of Rivets

In its 1940 report the committee gave consideration to rivets and riveting and remarked that "Cold-made rivets are well suited to heating in electric rivet heaters." This committee is of the opinion that this type of heater does not produce the uniformity in heating that can be obtained with those forms of heaters having firebrick lining designed for use with oil burners. Since, with the electric heaters, the ends of the rivets are heated first, it is apparent that there must be considerable variation in the temperature from one end of the rivet to the other. In order to secure proper and uniform filling of the holes, it is desirable that this condition be avoided. Proper expansion of the hot rivet in the hole and satisfactory formation of the heads may be obtained when the rivet is held between 1,800 and 1,900 deg. F.

Rivet Pressures

In the consideration of rivet pressures, it is necessary to distinguish between pressures per square inch of rivet diameter and pressures per square inch of the rivet hole. It is obviously necessary that the holes be increased beyond the normal diameter of the rivet in order to provide for expansion of the rivets under the temperatures to which they are heated and it is likewise necessary that the pressures be expressed in net tons actually applied to the rivet. Pressures at the accumulator may be substantially reduced because of factors introduced by the design of the bull riveter itself. The bull riveter is generally provided with a release mechanism which exerts a pressure opposite to that required in driving the rivet itself. Other factors also tend to reduce the net pressure of application below what it would be without these factors. These are friction of the parts both of the bull and the piston packing. Variation in these factors requires that their influence be determined so that the pressure actually applied to the rivet may be the net pressure after allowance for these factors. Obviously, it

Fig. 4

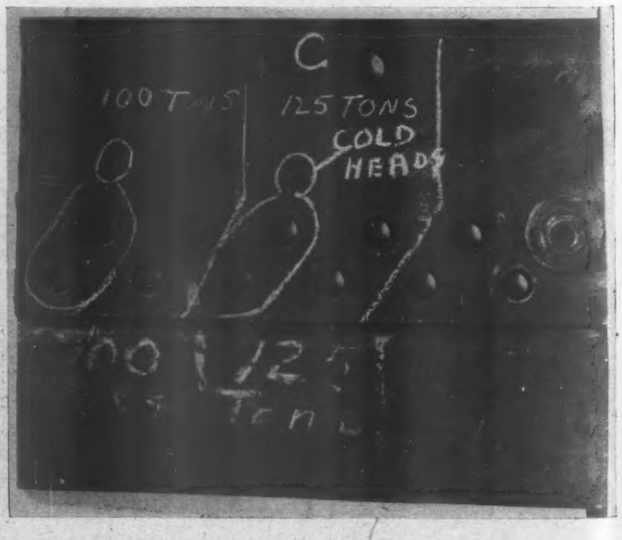


Fig. 5

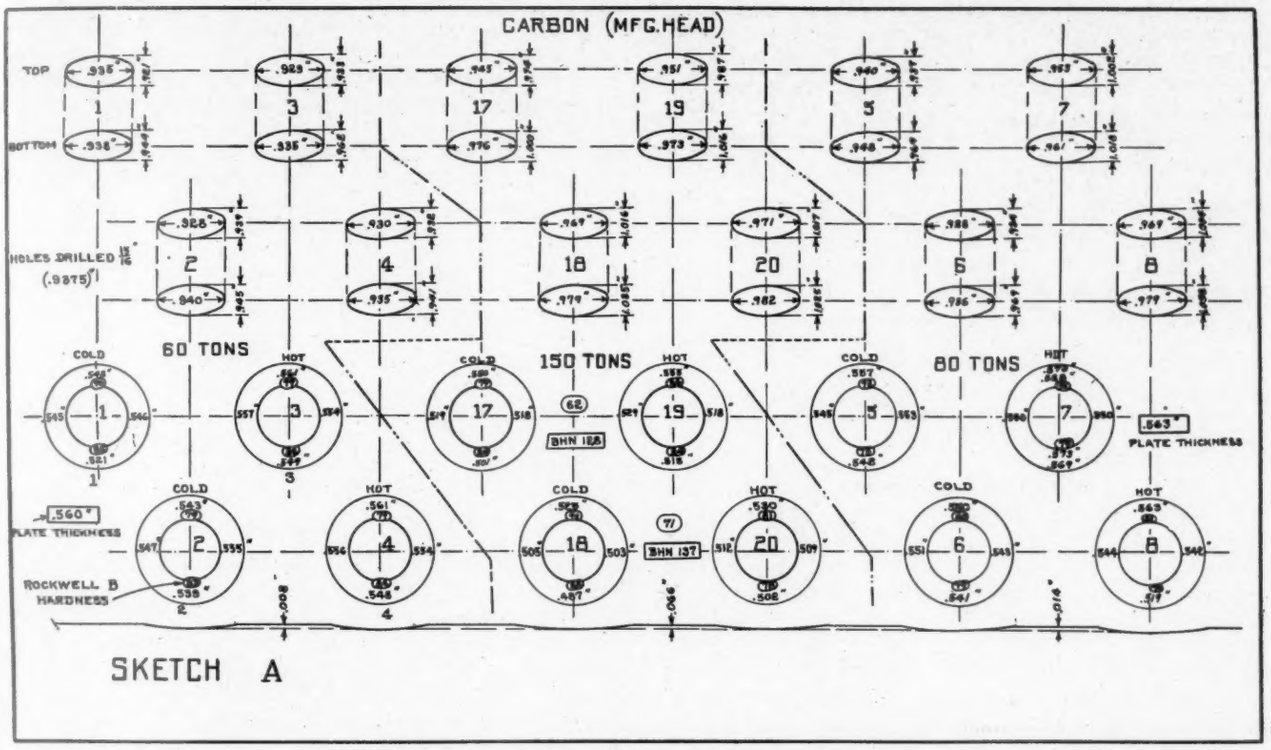


Fig. 6

is necessary that this determination be made separately for each bull riveter.

Experimental Data

In order to determine the effect upon plates produced by different riveting pressures, sections were made by the American Locomotive Company and tested with carbon-steel plates and carbon-steel rivets. The following photographs show the conditions which developed on driving carbon-steel rivets at the pressures shown.

Figs. 2 and 3 show condition which developed on the surface of the plate after the rivets were driven at the several pressures shown in the photographs. Rivets which were driven with the temperature of the rivet on the cold side are encircled in white; whereas, those which are not encircled in white were driven at a more normal heating temperature.

Figs. 4 and 5 show the condition of the surface of the plate, including that under the head of the rivets, as well as the condition of the rivet holes. These rivets were carefully removed in the laboratory by machining and driving out.

Particular attention is called to the scalloped condition which developed to a minor degree at 100 tons and which appears more pronounced at pressures of 125 and 150 tons.

The sketches in Figs. 6 and 7 correspond with photographs in Figs. 2 to 5, inclusive. The Brinell hardness tests of the plate itself are shown, together with Rockwell B hardness tests of the plate in the area unaffected by the riveting pressures, as well as results in the area of the plate under the rivet head affected by riveting pressures. The Rockwell hardness tests appear to show variations approximately as follows:

Effect on Rockwell Hardness of Riveting Pressures

Temperature	Hole No.	Position	Transversely	Longitudinally
		60 Tons		
Cold	1	Top	0.935	0.921
		Bottom	0.938	0.944
	2	Top	0.928	0.939
		Bottom	0.940	0.945
Hot	3	Top	0.929	0.933
		Bottom	0.935	0.962
	4	Top	0.930	0.932
		Bottom	0.935	0.941
		80 Tons		
Cold	5	Top	0.940	0.937
		Bottom	0.948	0.969
	6	Top	0.928	0.934
		Bottom	0.936	0.969
Hot	7	Top	0.953	1.002
		Bottom	0.961	1.018
	8	Top	0.969	1.004
		Bottom	0.979	1.058
		100 Tons		
Cold	9	Top	0.966	0.937
		Bottom	0.951	0.949
	10	Top	0.965	0.960
		Bottom	0.991	0.979
Hot	11	Top	0.936	0.946
		Bottom	0.949	0.957
	12	Top	0.946	0.957
		Bottom	0.956	0.966
		125 Tons		
Cold	13	Top	0.926	0.943
		Bottom	0.945	0.969
	14	Top	0.960	0.962
		Bottom	0.977	0.996
Hot	15	Top	0.956	0.964
		Bottom	0.968	1.011
	16	Top	0.957	0.976
		Bottom	0.968	0.982
		150 Tons		
Cold	17	Top	0.945	0.974
		Bottom	0.976	1.000
	18	Top	0.969	1.016
		Bottom	0.979	1.035
Hot	19	Top	0.951	0.987
		Bottom	0.973	1.016
	20	Top	0.971	1.017
		Bottom	0.982	1.025

Carbon Plate (Figs. 6 and 7)

Unaffected by riveting pressures, Rockwell B Hardness 62-73

Under head driving pressure Tons	Rockwell Hardness
60	79-86
80	75-81
100	78-89
125	76-93
150	78-90

Measurements were taken in two directions at the inner and outer side of the plate to show the amount of distortion of the rivet holes after driving rivets at different temperatures and pressures. The findings were as shown in the table.

Particular attention is invited to the variation in the thickness of the plate under the rivet head after being driven at the various pressures. The discrepancies observed are listed below:

THICKNESS 0.563 - CARBON

Tons		Thickness under rivet, in.	Difference, in.
60	Cold	0.521—0.555	0.042—0.008
	Hot	0.548—0.561	0.015—0.002
80	Cold	0.541—0.557	0.022—0.006
	Hot	0.519—0.588	0.044—0.025+
100	Cold	0.503—0.554	0.060—0.009
	Hot	0.526—0.560	0.037—0.003
125	Cold	0.506—0.553	0.057—0.010
	Hot	0.511—0.560	0.052—0.003
150	Cold	0.487—0.550	0.076—0.013
	Hot	0.502—0.555	0.061—0.008

The results of this investigation appear to warrant the conclusion that the plate material is considerably affected at pressures of 125 and 150 tons, which obviously makes it desirable to hold rivet pressures below the higher of these two values.

The experience of the locomotive builders has indicated that a driving pressure approximating 85 tons per sq. in. of driving rivet area will provide sufficient pressure and suit the bull riveters now available to the builders. On this basis, the committee proposes the adoption of the following driving pressures which it will be observed do not exceed a maximum of 125 tons per sq. in. for the great majority of rivets required in modern boiler construction:

Diameter, in.		Area, sq. in.		Total pressure (tons) on rivet hole at 85 tons per sq. in.	Recommended tolerances
Rivet	Hole	Rivet	Hole		
⅞	15/16	0.6013	0.6903	58.675	55–62
1	1 1/16	0.7854	0.8866	75.361	60–80
1 1/16	1 1/8	0.994	1.1075	94.137	85–100
1 1/8	1 3/16	1.227	1.353	115.005	108–122
1 3/16	1 1/4	1.4849	1.623	137.955	131–148
1 1/2	1 5/8	1.7671	1.9175	162.987	153–164

The original assignment of this subject covered alloy materials both for plates and rivets, but since nickel is the alloy most generally used and since the defense program has affected the availability of this material, it has been impossible to make experiments for the verification of the existing, or the development of new, practices with respect to materials in which this alloy element is utilized.

The committee suggested the advisability of a trial of the recommendations that have been made and that a report be rendered in verification or otherwise of the standard practices which are proposed. This will permit a supplementary report to be made recommending standards of pressure and holding time for adoption by the A. A. R. Mechanical Division. This will require that the subject be continued and a report rendered to the Association in 1942.

[Note—The report included a table of allowable variations for carbon steel bars and tables of dimensions and tolerances for four styles of rivets.—EDITOR.]

The report was signed by A. G. Trumbull (C. & O.-P. M.); E. H. Heidel (C. M. St. P. & P.); Frank Yochem (Mo. P.); L. C. Ruber; G. C. Mullenhour (Lima Loco. Wks.); J. A. Graulty (American Loco. Co.) and Albert F. Stiglmeier (N. Y. C.).

Discussion

Several members raised a question as to the type of caulking tool that should be used. The majority favored the square-nosed design, though others favored the round-nosed type and a combination square- and round-nosed type. It was decided that the committee should give further consideration to this subject.

The discussion of this topic further developed that roads using high-pressure alloy steel boilers are experiencing considerable trouble with cracking around the caulking edge and rivet holes. It was suggested that a further study should be made to determine whether the cause may be poor workmanship, improper supervision, faulty materials, or incorrect boiler design. Some of the suggestions offered to eliminate leakage and cracking were: closer fitting of the parts, that is metal to metal; filling up the rivet holes; caulk the seams inside and out with a square-nosed tool and closer supervision of the workmen.

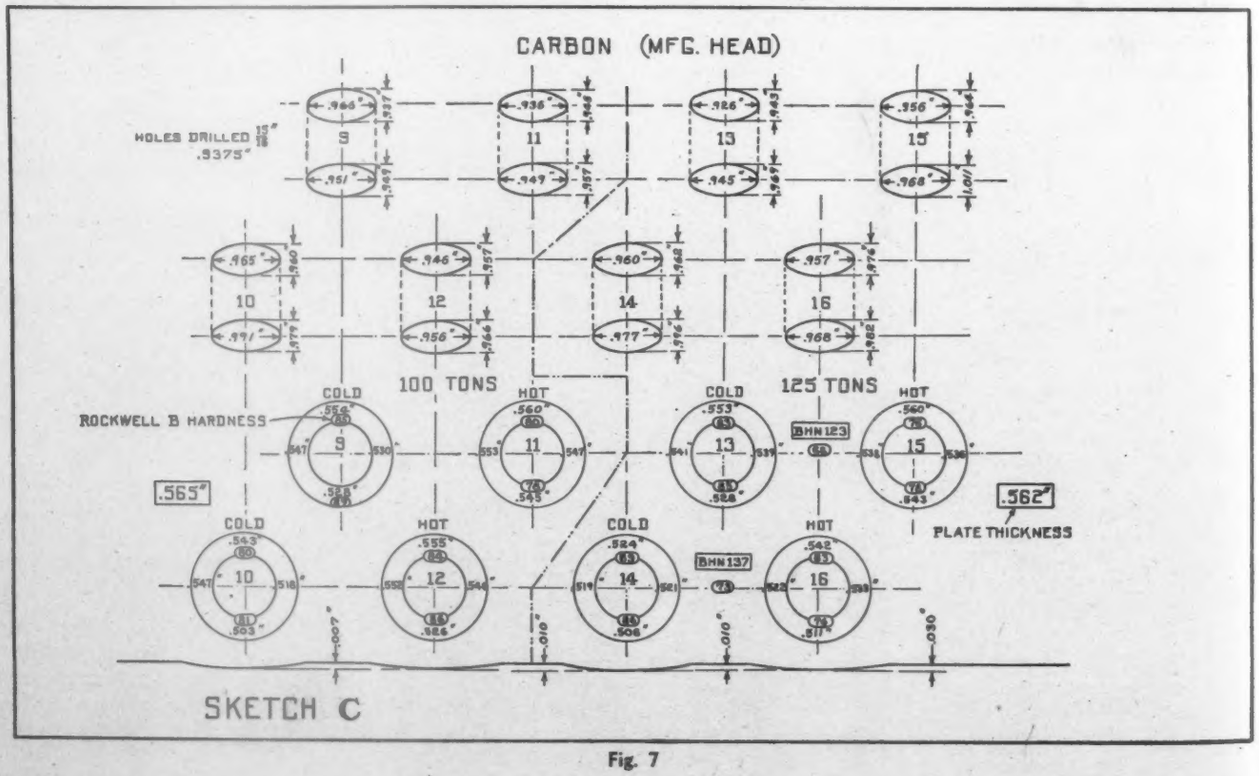


Fig. 7

Great Northern Cabooses

(*Continued from page 100*)

plates. The customary end ladders are supplied, with a safety railing at the roof end of the ladders.

The inside dimensions of the caboose are: length, 30 ft., width 9 ft. 2¼ in., height 7 ft. 4 in. The outside dimensions are: top of rail to top of caboose floor, 3 ft. 10⅜ in.; overall length, 37 ft. 6 in.; overall height, 14 ft. 8¼ in.; weight, 500,100 lb. The low floor line gave ample overhead room in both the body and the cupola without encroaching on clearances. The outside width was purposely made to about that of a standard box car for visibility and for safety in making running catches, the cupola being of the same width as the car body.

The outside body paint is Great Northern standard bright red, with gold colored stenciling and black trim. The underframe and trucks are black. Car cement was extensively used between and over the steel assemblies, also over wood parts where decay might start. The inside finish is varnish over natural wood, and the floor is painted with a deep red floor enamel.

In the body of the car there are four windows on each side and two in each end with shatterproof glass in the upper panel of end doors. All body windows are fixed except one side window on each side next to the conductor's desks. All caboose windows have double glass, set in sponge rubber to make the space between air tight. All body windows have shades and a rather unique screen door arrangement is provided. Two conductor's desks and seats, in diagonally opposite corners, enable the conductor to sit facing the rear of the train regardless of the direction in which the caboose is turned. In case of a sudden stop the trainman occupying the seat is thus jarred away from the desk, against the upholstered seat back and possible injuries are minimized. Facing the back, the conductor can keep watch for anything dragging and constantly keep oriented as to train movements. A look-ahead mirror outside the desk window, which is on the right side of train, also enables him to watch the approach to stations, block signals, etc., and to scan the side of the train.

Caboose Interior Streamlined

The wide interior makes possible a wide aisle with ample depth for lockers. In the streamlined interior, all unnecessary jogs are avoided; all corners are well rounded, and locker latches and other interior fittings are fully recessed. This eliminates the hazard of possible injury to men striking sharp corners and projections when thrown off balance. The built-in ice box has ample storage capacity. There are three large clothes lockers and a toilet room with hangers for rough clothing. All lockers and the toilet room have galvanized-iron-covered floors and interiors painted with white enamel. The toilet has a roof ventilator. There are two water coolers, one with a separate ice compartment for drinking water and a large one for wash water. The stove is a standard low-type Estate, equipped with a guard rail on each side fastened to the stove top. The stove pipe and jack are of No. 14 gage steel. The coal box is extra large and has a lid which may be used as a work bench for cleaning markers, etc. Aladdin lamps are used for light.

There are four metal bunks with metal floor linings, three of which are for bedding storage and have the interiors painted white enamel. The fourth has brackets for the storage of markers when not in use and is partitioned off for storage of brassing equipment and tools. Chains, cables, and other heavy equipment is stored in a weatherproof metal tool cellar underneath the car body.

The ladders leading up to the cupola platform are recessed. Handholds are attached to the seat, and a "monkey bar" extends longitudinally in the upper part of the cupola. The cupola seats are metal framed, upholstered, two on each side facing each other. There are four narrow end windows. The side windows are double sliding in weatherproof metal guides and so arranged that a trainman sitting in the cupola can slide the window forward, stick out his head to view the train, and yet remain firmly seated and protected against train shocks. A fold-back metal-frame cinder guard, attached between the windows, and a roof gutter protects against roof drippings. There is a standard fuse rack and torpedo box. Single emergency fuse clips are located on seat ends in the cupola and at each end door for quick emergency use.

Karl Fritjof Nystrom, D. Eng.

(*Continued from page 98*)

rehabilitation of boys and young men who have strayed from the narrow path and have gotten into serious difficulties of one sort or another, sorely needing a helping hand to restore their self respect and manhood.

Hobbies

The chief operating officer, concerned at Mr. Nystrom's close application to his work, suggested at one time that he let up a bit and learn to play golf. According to one of his friends, however, "his efforts were not very successful, for, while he made an attempt at golf, his clear cut misses of the ball were more numerous than his hits, which included a goodly percentage of tops, slices and hooks."

Mr. Nystrom has always been a lover of the out-of-doors and is fond of fishing. His principal diversion is working around his summer home at Lake Nagawicka, near Delafield, Wis. An interesting sidelight on his character is evident from the comments of one of his friends: "If you are there (Nagawicka) for long you are apt early in the morning to observe him strolling about the place quietly studying his bird friends that abound thereabout. They are all his friends; he never harms an innocent creature that God created for his joy. His thoughts seem always to be of construction and protection."

Mr. Nystrom is an active member of the Methodist Church.

In Conclusion

"Doctor of Engineering!" What different connotations this title has today as compared to the time when Mr. Nystrom was graduated from college. One considered the "Dr. Engr." in those earlier days as a man of a high degree of technical learning and accomplishment—as a sort of rare chap to be found back in the laboratory or the class room—a great designer, a researcher, a scholar in the field of applied science.

In these later days it may still mean that, or it may stand for something more, something virile, something dynamic that leads men and develops their potentialities, as well as harnessing the forces of nature and utilizing its materials. And to those scientists and engineers, who are outstanding leaders of men, also, we bow in humble admiration.

A. A. R. Acts to Conserve Critical Materials

(*Continued from page 92*)

vention of train delays, safety, health, sanitation and fire prevention.

Exhibit B—List of items made of rubber or containing rubber regarding which a substitute is recommended. This list includes those items the uses of which are presently not so important, such as cost, comfort, convenience or where conditions do not warrant present standards.

Exhibit C—List of items made of rubber or containing rubber regarding which a partial substitution may be made but concerning which it is necessary to conduct further investigation before making definite recommendations.

Due to inability to attend our meeting on account of presence in Washington of the Technical Committee of the Rubber Manufacturers' Association, we are unable to include at this time the per cent reduction in rubber. As information and other materials are developed it may be possible to transfer some of these to Exhibits A or B.

Hose

With respect to hose, the following special recommendations are submitted:

1—Reduce length of hose now in use all possible and return the excess to the store stock.

2—Reduce length of hose to the absolute minimum by additional pipe lines and outlets.

3—Eliminate hose entirely by the installation of pipe lines and flexible metallic joints for yard heating and charging lines, oil handling installations, boiler washing and filling, and wherever practicable.

4—Use flexible metallic hose wherever possible in carefully installed permanent installations where there are no torsional stresses.

5—Prevent injury to hose during application of fittings by close supervision.

6—Prevent injury to hose by trucks and other vehicles by the use of protective planking, overhead hangers or other means and, if necessary, by relocating outlets.

7—Salvage hose all possible by removing any damaged portion and coupling or splicing serviceable lengths.

8—Uncouple air-brake and air-signal hose before parting cars.

9—Air-brake hose should not be removed from service except as required by Interchange Rule 56.

10—Check rolling stock periodically and return to store stock excess quantity of emergency hose.

The secretary is requested to refer to the Committee on Specifications for Materials and Committee on Brakes and Brake Equipment the suggestion that the thickness of end caps of air-brake and air signal hose be reduced or caps eliminated entirely by using an adequate sealing compound.

Insulated Wire and Cable

These items are referred to the Electrical and Signal Sections but, after consultation with wire and cable manufacturers, we recommend considering the following:

*1—Use copper wire of the smallest circular mil which will carry the required current and thus effect reduction in both copper and insulation.

*2—Use paper or varnish cambric insulation wherever permissible.

*3—Substitute synthetic or asbestos insulation for special installations.

*4—Reduce rubber content to the limit of safety.

5—Reduce length of extension cords, welding and battery-charging cables and all portable cords and cables to the minimum.

6—Repair portable cords and cables by splicing and vulcanizing.

Storage Batteries and Parts

These items are referred to the Electrical and Signal sections but, after consultation with the manufacturers, we recommend consideration of the following:

1—Discontinue purchase and change existing orders for monobloc or similar container assembly of car-lighting and air-conditioning batteries and use wood tray and rubber jar assembly, thereby effecting a saving of approximately 60 per cent in crude rubber for containers.

2—Reduce the number of sizes of car-lighting batteries to four or five. Consider standardizing to 300, 450 and 600 amp. hrs. and the largest wood tray assembly which can be installed in the standard A. A. R. compartment. The latter size may be from 800 to 1,000 amp. hr. capacity, dependent upon the thickness of the plate used by the manufacturer.

3—Standardize on the size and reduce the number of sizes of cable.

4—Discontinue the use of abnormally long inter-tray connectors now used to permit servicing of batteries without disconnecting them.

5—Assign partially exhausted batteries, i. e., 80 per cent of rated capacity, to an installation of lighter duty where the reduced capacity is ample for the service.

6—Save cable, connectors, containers, jars, etc., for use in repairing batteries.

7—Return to the manufacturers old batteries and excess parts for use in rebuilding.

8—The Edison Storage Battery Division are studying synthetic resin-like materials in place of rubber for electrical insulation in alkaline solutions.

Reclamation of Rubber

1—All rubber products when not in active use should be stored in a cool, well ventilated location and should not be exposed to sunlight.

2—Use rubber products in rotation according to receipt in storerooms so as to reduce deterioration due to age to a minimum.

3—When overhauling devices or equipment containing rubber parts, careful consideration should be given to the condition of such parts and return them to service if warranted rather than to replace regardless of condition simply because of servicing the device.

4—Check shops, enginehouses, yard buildings and supply boxes periodically for excess quantities of packings, gaskets, discs, washers, diaphragms, etc., and return excess to store stock.

5—Check the use of rubber matting in unnecessary locations so as to make available for essential purposes.

6—No rubber scrap of any kind should be burned or otherwise disposed of. It should be accumulated and sent to one or more central points on the railroad for reclamation and manufacture into gaskets, stripping, mats, stops, bumpers, sleeves, protective coverings or in place of new rubber parts or parts of which rubber is a component.

7—The practice of burning insulation from wire should be discontinued. All insulated wire returned to scrap docks or reclamation plants should be carefully inspected and usable portions recovered for further use. Such wire as is beyond reclamation should be stripped of its insulation and the copper and rubber recovered.

* These four items are subject to the requirements of local and national code authorities.

EDITORIALS

There Must Be No Letdown!

As sufficient weeks of 1942 have elapsed to give some indication of the trend of railway freight traffic it seems apparent that the freight-car loadings which the railways will be required to handle this year are going to exceed those of 1941 by somewhat more than 10 per cent. A 10-per cent increase in car loadings was the basis for many of the estimates made during the latter part of 1941 to determine the amount of new motive power and rolling stock which would be needed during 1942 to insure the free movement of the commerce of the nation. Car loadings during the first seven weeks of the current year amounted to 5,423,000, an increase of 11 per cent over the number of cars loaded during the similar period of 1941.

Several aspects of the car and locomotive situation indicate the relative shortness of the supply of equipment, and at the same time tell a story of steadily growing efficiency of utilization which throws into the discard all previous indices for measuring the capacity of the railways' supply of locomotives and freight cars. For instance, the percentage of freight cars on line undergoing or awaiting repairs, which reached the unprecedented low of 4.1 during the late fall, had dropped still further to 3.8 by the middle of January. The per cent of freight locomotives out of service for class repairs, which had dropped steadily from 17.4 since the fall peak of 1940, was 10.7 during October, 1941, and had gone on down to 9.4 in January, 1942. The average daily mileage per serviceable freight locomotive increased from 113.8 in October, 1940, to 124.3 in October, 1941. The upward trend in the utilization of serviceable freight cars is even more striking. The average daily mileage per car was 41.7 during October, 1940; it went up to 46.9 during October, 1941. The overall effectiveness of the freight car as a traffic mover is reflected in net ton-miles per car day which increased from 666 in October, 1940, to 852 in October, 1941—over 27 per cent.

Whether one interprets these as marked improvements in the utilization of freight motive power and rolling stock or as evidences of growing strain on the railroads, it is clearly evident that to maintain the standards already attained and, if possible, to raise them still higher, is going to require the utmost care on the part of all equipment maintenance forces. There must be no letting down in the high standards of maintenance which now prevail. Loaded freight cars must be kept off repair tracks as long as they are safe to run, but when cars go in for repairs they should be put in condition to stay off repair tracks for a long time. Similarly, when locomotives are withheld from service for monthly inspection, nothing should be neglected which will keep them off the work reports for the next thirty days. And when locomotives are turned out of the shops after class repairs there must be no doubt as to the effective restoration of the full mileage quota. Slipping backward at any of these points will inevitably cause a reversal of the present encouraging trend in the ton-mile-producing capacity of freight cars and locomotives.

Why Not Railroad "Shop Engineers"?

For years it has been one of the popular pastimes of the critics of the railroads to draw comparisons of the manner in which things are done in this business with the way they are done in other industries that are reputed to be much more efficient. Almost since the first day that the automotive industry started to produce parts and perform assembly operations on a mass production basis there have been those who have expressed the opinion that if the railroad shops would adopt the methods of the automotive plant the efficiency of our repair plants would be greatly improved.

Before it is safe to express a positive opinion it is usually considered worth while to gather the facts necessary to arrive at a conclusion. The critics of the railroad repair shops have often expressed the opinion that they are obsolete in equipment, haphazardly arranged and inefficiently operated. On the other hand there have been many opinions offered in an attempt to prove that such is not the case. The question we would like to raise at this time is, "Upon what conclusive facts do the critics and the defenders of railroad shop practices base their opinions?" Possibly it might be worth while to review some of the evidence that has been brought out in this "case" over a period of many years.

Who are the critics of railroad shop operating methods? They may be divided roughly into two classes: one group made up of those whose contact with other industries—usually in a sales or service capacity—has caused them to be impressed by the differences in facilities and practices existing between the railroad and industrial shop, and another group made up of those who have made a sufficiently thorough study of the problem to have convinced themselves that there is room for marked improvement in railroad shop operation.

What are the basic characteristics of the criticism

that has been offered? The first-mentioned group of critics has emphasized the need for more modern equipment; mass-production methods of manufacture and assembly; the use of more jigs and fixtures to speed up operations and reduce the cost thereof; the use of modern cutting steels and, among other things, the setting up of a depreciation reserve out of which replacement equipment could be purchased in sufficient quantity to maintain a satisfactory "average-age" condition with respect to machine tools and shop equipment. As to the second group of critics, they have included all of the above items in their criticism and have added the opinion that without the recognition by management of the importance of this shop problem and its support in remedying certain conditions there is not too much hope for a satisfactory solution.

Why the Critics Fail to Convince

If the critics are guilty of anything at all it is that the first group has not taken the trouble to study the problem as thoroughly as the second group and the second group has not taken the trouble to inform their own managements concerning certain fundamental facts. Unfortunately both groups have done most of their work in the dark for an examination of certain conditions surrounding railroad shop operation will convince almost anyone that the necessary facts with which to draw conclusions and to express opinions do not exist with respect to the railroad industry as a whole. The reason why they do not exist is that, with a few important exceptions, the railroads have never considered such facts important enough to justify the expense necessary to secure them.

If there is any one thing in which the automotive and general industrial field can be said to have done that the railroad industry has not done, it is the development and encouragement of shop and tool engineering. It is the shop and tool engineer who made the automotive industry and it is these same experienced men who are converting that industry almost overnight into war production plants that are already turning out the things we need to win the war.

What is a shop or production engineer and what is his function in an organization? Definitions may differ but fundamentally a shop or production engineer is one who takes certain facilities, a given number of man-hours of labor and quantities of materials and works out a production plan whereby these elements are so utilized that the greatest number of completed units are turned out at the lowest possible cost consistent with a predetermined standard of quality. The function of such an engineer in an organization is to procure the facilities required by the production plan and advise the management as to the number of men and the quantities of material needed to perform the job. Needless to say the production or shop engineering department of an industrial organization could never perform its functions without having vested in it the necessary authority to the exercise of control over the detail manner in which its plan is carried out.

Does the railroad industry have this type of engineering? Before attempting to answer such a question it may be well to define the job a railroad is called upon to do. A railroad produces transportation service measured in ton-miles rather than automobiles, refrigerators, radios or electric light bulbs. Until the ultimate consumer decides to buy and the manufacturer decides how much he will produce, a railroad has no idea how much service it may be called upon to perform. Likewise the railroad repair shop has very little idea, in advance, how many locomotive-miles or car-miles it may be called upon to restore in the form of repaired or rebuilt cars or locomotives. So, the answer to the question may be that the production engineer of the railroad industry may be found, under another name, somewhere in the transportation department which, after all, is the place where railroad service is produced. The railroad repair shop is the place where the tools of transportation are kept in condition to do the job. It is important to note here that the job of a railroad shop is not a "production" job but a repair job—always presenting a problem in which the unknown factors are in the majority.

Does the Railroad Need the Shop Engineer?

Does the railroad industry need the shop engineer? In considering this question it is worth while to place considerable emphasis upon the facts that the railroad repair shop is dealing with all of the elements of production that an industrial plant is—facilities, man-hours and materials—plus an element that is more difficult to handle and one which complicates the problem more than anything else, namely, the impossibility of predicting accurately in advance, what the extent of the job will be; in other words, the unknown factors. When the complexity of the railroad shop problem is considered and to that is added the fact that, except in a few instances, no single individual or group in the shop is charged with the responsibility of planning shop operations as a whole and given the authority to procure the facilities and control the details of such a plan, it is remarkable that most of our shops operate as efficiently as they do. If there is any industry that could make use of the science of shop engineering it would seem that it should be the railroad industry for there, unlike a production industry, the unknown factors in the shop problem make careful planning an extremely important requisite.

In conclusion, it may be important to point out again that the single item of locomotive repairs (Account 308) is the largest item of railway operating expense. In-as-much as the facts do not exist to prove that this money is or is not being spent efficiently it might be worth while to find out. In most industrial plants the production or shop engineer could answer such a question with respect to his operations, and back up his answer with facts to prove it. Who would you ask in the railroad industry?

Conditioning Steel Car Surfaces Before Painting

One of the subjects, briefly but effectively covered at the last annual meeting of the Car Department Officers' Association, was the treatment which it is necessary to give both old and new steel surfaces of passenger cars preparatory to painting, and many of the comments, of course, apply equally well to freight equipment. While nothing startlingly new was developed in the short and more or less extemporaneous discussion presented by Harry Stahnke, painter foreman, New York Central, West Albany, N. Y., a number of the points which he made need to be constantly restated and emphasized.

Of the three different methods used to remove paint, namely, employment of an alkali stripper, paint remover, or sandblasting, the last is generally most feasible and highly effective since it removes paint, mill scale and rust and no other treatment is necessary preparatory to painting. In the case of liquid removers, the steel surfaces can be put in condition for painting by the use of a neutralizer, several of which, now on the market, are available and can do a good job. Experience indicates, however, that cost is a limiting factor in the use of paint removers where quantity production is required. When an alkali stripper is used for removing paint, it tends to get between the joints of steel sheets and shapes and, in spite of the utmost care in subsequent cleaning, traces of the alkali are liable to remain in these joints and disrupt the protective coating of paint after it has been applied.

Regarding the effect of mill scale on paint durability, Mr. Stahnke said, "It is the thought of many that there is not so much danger of trouble from mill scale as there is from common rust, but I think mill scale is just as much trouble, especially on the exteriors of cars. Mill scale will work loose with temperature changes and cause breaks in the paint, admitting moisture and causing corrosion. For this reason, mill scale should be removed, which can be done only by sandblasting." Mr. Stahnke went on to say that the expense of cleaning steel preparatory to painting should be regarded as an insurance against premature breaking down of paint finish which permits corrosion to develop.

It is obvious that rust also must be removed before a good paint job is assured, otherwise the deterioration of the steel will progress under the paint and proportionately decrease the life of the equipment. The points are made that paint should be applied directly to the surface to which it is meant to adhere and any good paint applied to a clean surface will outlast the best paint applied to a dirty or rusty surface. Once steel surfaces are placed in condition for painting, an elementary precaution is to get the paint on before any of the good work is undone by oxidation through exposure of the equipment to the elements.

When cars are received in the paint shop, the priming coats are applied and as many surfacer coats and putty and knifing as required, dependent upon the finish desired. Most railroads are now using either a lacquer or synthetic enamel for exterior finishing coats, which has caused some difficulty in keeping lettering, especially of the gold leaf-type, in satisfactory condition without renewing it between shopping periods. Apparently there is no size which will adhere to either lacquer or synthetic enamel perfectly; the pencil varnish breaks down under frequent washing, so the gold letters soon deteriorate.

One of the methods now successfully employed to overcome this difficulty is the spraying of letters, using a special mask and either lacquer or synthetic enamel, whichever comprises the finish coats on the exterior of the car. By using the same kind of material for lettering and finish coats, the lettering knits with the finish coat and both give the same service. Regarding this practice, Mr. Stahnke said, "We have been applying lettering by this method for a little more than a year and to date I have not seen any cars with the lettering wearing off and have not had any complaints from any source about having to renew letters due to lettering coming off where cars are washed."

In view of the importance of developing and broadcasting information regarding the best practices in painting railway equipment, as well as suitably preparing metal surfaces before application of the paint, it is hoped that the Car Department Officers' Association will be successful in its present plans to develop a competent committee on this subject and present a report for publication in its next annual year book which will contribute further to the knowledge of this subject.

New Book

LOCOMOTIVE CYCLOPEDIA. *1941 edition.—Compiled and edited by Roy V. Wright and Robert C. Augur under the supervision of an Advisory Committee of the Association of American Railroads, Mechanical Division. Published by the Simmons-Boardman Publishing Corporation, 30 Church street, New York. 1,312 pages, 9 in. by 12 in. About 4,000 illustrations. Price, $5, bound in fabrikoid.*

Many new designs of locomotives (steam, electric, Diesel and industrial) and appliances developed since the publication of the 1938 edition of the Locomotive Cyclopedia are included in the eleventh, or 1941 edition. While the same general arrangement has been followed, the material has been made more readily accessible by a more clearly defined division of sections and a somewhat altered arrangement. The list of contents by sections and subdivisions and the alphabetical index to locomotive parts have been improved, and on the first page of each section appears a summary of its contents. A revision has also been made in the figure numbers for the illustrations. While improvements in shops and engine terminals since 1938 have not been extensive, the section on Locomotive Shops and Engine Terminals has been revised and a chapter on welding and cutting added.

Tool Loads And Carbide Tools

*By Paul H. Miller**

One of the most common erroneous beliefs in connection with the adoption of carbide cutting tools to speed production, is that the higher cutting speeds recommended for such tools impose greater forces on the work and tool. Actually, the opposite is the case more frequently than not.

Many a shop man has hesitated to use carbide tools for such reasons as: (1) A belief that the increased rate of metal removal will increase the tendency for the work to slip in the chuck; (2) That it will be necessary to tighten the chuck too much to prevent slipping and thus distort the work; (3) A belief that the increased cutting speed will cause long work to 'twist up' to a greater extent and (4) That there will be an increased tendency to distort thin wall (hollow) parts, etc., due to increased pressure of the tool against the work.

Table I — Constants for Calculating Power Requirements and Tool Loads for Various Materials

Material	Power Constant
SAE 1010-1025	6
SAE 1030-1095	8
SAE 1112-1120	6
SAE X1314-X1340	6
SAE T1330-T1350	9
SAE 2015-2320	7
SAE 2330-2350	9
SAE 3115-3130	8
SAE 3135-3450	9
SAE 4130-4820	9
SAE 5120-52,100	10
SAE 6115-6195	10
Cast steel	9
Cast iron, hard	4
Cast iron, medium	3
Cast iron, soft	3
Cast iron, hard (alloy)	4
Cast iron, medium (alloy)	3
Cast iron, soft (alloy)	3
Cast iron, up to 25 per cent semi-steel	3
Cast iron, over 25 per cent, semi-steel	4
Cast iron brake drums	4
Cast iron chilled rolls	5
Malleable iron, hard	5
Malleable iron, medium	4
Malleable iron, soft	3
Brass and bronze, hard	10
Brass and bronze, soft	4
Aluminum castings	3
Aluminum bar stock	4
Copper	4
Commutators	4

The basis of such beliefs is probably the fact that the increased rate of metal removal by the machine, when carbide tools are used and the machine is speeded up, involves in turn an increase in the amount of horsepower required.

Actually, the increase in horsepower required may be accompanied by a decrease in tool loads and torque, as simple basic engineering considerations demonstrate.

What Determines Tool Load?

For a given set-up tool loads, pressure on the tool and by the tool on the work are determined by two major factors: The cross sectional area of the chip, and the nature of the material being cut. It can be expressed by a simple formula:

$$W = F \times D \times K \times 33{,}000$$

in which

W = total tool load, lb.
F = feed, in.
D = depth of cut, in.
K = constant for material (see Table I)

The value of the constant varies from 6 to 10 for different classes of steel, and from 3 to 5 for different types of cast and malleable irons. For all, except the extremely hard bronzes and brasses, the constant is around 3 to 4. For the hard-to-machine non-ferrous metals, it may run as high as 10.

Irrespective of the value of this constant, however, it will be noted that the actual tool load is to all practical purposes independent of cutting speed.

Cutting Torque

To determine the cutting torque, which determines also the amount of twist or the tendency of the work to slip in the chuck, etc., it is necessary only to multiply the tool load figure by the distance of the tool from the center of the work. Again it will be noted that speed has nothing to do with the subject.

Calculation of the Horsepower Required with Carbide Cutting Tools

The reason that more horsepower is required with carbide tools at higher cutting speeds is shown by the formula:

$$\text{Hp.} = \frac{W \times C}{33{,}000}$$

in which

W = tool load, lb.
C = cutting speed, ft. per min.

or by the formula:

$$\text{Hp.} = D \times F \times C \times K$$

in which

D = depth of cut, in.
F = feed, in.
C = cutting (or surface) speed, ft. per min.
K = constant for material (Table I)

This formula makes it evident that, even when the tool load is kept constant (that is, the feed and depth of cut are unchanged), the horsepower required increases whenever the speed is increased. This is the horsepower required for actual cutting.

To determine the total amount of motor horsepower required by the machine when switching to carbide tools, it is of course necessary to add to the above figure the horsepower lost in driving the machine itself at the higher speeds recommended for carbide cutting tools. This is usually estimated at around 30 per cent of cutting horsepower.

The Horsepower Is Higher But The Torque Is Lower

Actually in a great many cases when a job is switched from high-speed steel to carbide tooling, the amount of torque and the tool loading is decreased. As a matter of fact, in some cases, particularly on extremely large work, it is actually necessary to decrease the tool load to make the carbide tools perform properly.

Carbide tools, inherently, cannot take as great a maximum loading (pressure) as can high-speed steel tools. On extremely large work where slow speeds have been used with deep cuts and large feeds, it is sometimes necessary to decrease the feed to prevent tool breakage. This decrease is, of course, more than made up in metal removal by the increased speed at which the cutting is done.

For instance, let us take a typical large job tooled with high-speed steel tools with the following performance:

Outside diameter of work, in.	36
Depth of cut, in.	½

* Chief engineer, Carboloy Company, Inc.

Feed, in.	3/16
Maximum cutting speed, ft. per min.	40
Horsepower required for cutting	22½

The amount of metal removed here is 45 cu. in. per min. ($\frac{1}{2} \times \frac{3}{16} \times 40 \times 12$).

When this job is tooled with carbides, let us assume the following operating conditions:

Depth of cut, in.	½
Feed, in.	reduced to 3/32
Cutting speed, ft. per min.	raised to 125

Here is what has happened. The amount of metal removed is now 70 cu. in. per min., a gain of 55 per cent. The horsepower required for cutting has been increased to around 35, an increase of 55 per cent. But tool load, or pressure, has been reduced 50 per cent since the feed and, therefore, the cross section of the chip, is reduced by 50 per cent, and the torque on the work and the chuck has also been reduced by 50 per cent for the same reason.

Thus, while the rate of metal removal and the horsepower required have gone up, the tendency of the work to slip in the chuck has been cut in half; the tendency to twist has been cut in half and the tendency to distort the work by cutting pressure has also been reduced 50 per cent. At the same time, finish has been improved by means of the finer feed used; tool life between grinds has been increased due to the harder carbide tools and the amount of down-time has been decreased in proportion.

One of the pits showing protective grating—The entrance-way grating cover is partially raised

Albuquerque Locomotive Inspection Pit

The locomotive inspection pit, illustrated, is located opposite the enginehouse on the main line of the Atchison, Topeka & Santa Fe, a short distance west of the station at Albuquerque, N. M., where it saves labor and reduces time in servicing through locomotives. The principal feature of this combined inspection pit and locomotive servicing station consists of four standpipes or cranes, the two outer ones supplying water and the two inner ones fuel oil. These cranes are located midway between the two main-line tracks so as to serve locomotives on either side. Two inspection pits, 120-ft. long by 38-in. deep, are located in the main tracks adjacent to the fuel and water cranes. They are staggered 45-ft. with respect to the cranes, so that when spotted at the cranes from either

Fuel oil and water standpipes, lighting facilities, pits, etc., at Albuquerque, N. M.

A locomotive being serviced on one of the inspection pits of the Atchison, Topeka & Santa Fe at Albuquerque, N. M.

direction, both the locomotive and its tender are over an inspection pit.

With these large-capacity cranes, a 7,000-gal. fuel tank and a 20,000-gal. water tank can be filled simultaneously in an average of about five minutes. During this time other necessary servicing, inspecting and lubricating work is also done. Altogether, this takes an average of about seven or eight minutes for a large locomotive. Trains from the West are stopped with the locomotive over the inspection pit long enough for this work to be done. In the case of trains from the East, the locomotives are uncoupled at the station and moved down to the inspection pit for servicing, while the cars at the station are loaded with baggage, mail, train supplies, etc.

As a safety measure sectional grating is placed between the rails when the inspection pits are not in use. These grating sections can be easily removed and may be piled one on the other, or slid along the tracks in any way to suit the inspectors working under locomotives. Access to each inspection pit is had by means of an entrance way, 3½-ft. wide by 5-ft. long, outside the track. This is also covered with a grating.

Other fixed facilities at this modern locomotive servicing station include a large cylindrical sand-supply tank for each track; air-storage drums installed in the yard air line to avoid fluctuations of pressure when filling grease cups; a steam-heated box through which air lines pass to warm the air slightly and eliminate moisture condensation in severe cold weather; and a long supply house or shed located next to the outer fence, containing additional dry sand, soaking vats for packing, heater oil cans and journal grease, carbon cleaning tools, telephone, and rest room for crews.

The entire inspection pit area is exceptionally well lighted for night operation. The 200-watt lamps and reflectors on two tall poles, between the tracks, throw light on sand domes and facilitate the work of men who supply sand. Four short poles, also equipped with 200-watt lamps and reflectors, are spaced on 30-ft. centers and located along the side of each inspection pit so that ample light is available to inspect the lower parts of the locomotive, including all motion work parts and running gear.

When a locomotive is received at the inspection pit for servicing, men are assigned to fill the fuel tank, water tank, sand dome, mechanical lubricators, etc., simultaneously. A hand test of all bearings is made and if any are hot enough to indicate the possibility of serious trouble before reaching the next terminal, the locomotive is cut out and sent to the enginehouse. All friction bearings are lubricated; rod cups are filled with grease by means of a grease gun using air from the engine on the left side and yard air on the right. The firebox is checked for carbon on the fire-brick wall, any accumulation found being removed by the special tools mentioned. All motion parts, running gear, wheels, etc., are inspected; cab windows washed, etc.

As a rule, two inspectors work at the same time, one underneath the locomotive and the other on the outside. The total time required for servicing a large locomotive is from seven to eight minutes, as stated, and the crew comprises 16 men, including the foreman, two mechanical inspectors, one pipefitter, and one boilermaker. The rest are helpers and laborers. These men are regularly employed in the enginehouse nearby and come to the inspection pit only a few minutes before a locomotive is due, leaving it immediately after the servicing operations have been completed and the locomotive sent on its way. This locomotive servicing layout has saved considerable time and labor in the actual servicing operations, but by far its greatest advantage has been the conservation of locomotive hours formerly spent going to and from the enginehouse and, hence, not available for the movement of trains.

Short-Turning Shop Truck For Light Loads

A small shop truck, with a short turning radius and small over-all dimensions, is being built by the Buda Co., Harvey, Ill. The truck can be turned in a radius of 7 ft. 3 in., weighs 800 lb., with a load capacity of 1,000 lb., has a loading area of 12.8 sq. ft. and a maximum speed of 15 m.p.h.

The Chore Boy is driven by a 4-cycle, air-cooled, 7.7 hp. engine and is said to be low on fuel consumption,

averaging 35 miles per gallon of gas. Magneto ignition is used for starting; a friction drive with forward and reverse speeds and a neutral position for idling is hand-controlled by the operator. The brake is of the internal

Buda "Chore Boy" with a load of rerailers

expanding type on an intermediate shaft and is applied by a standard brake pedal. A seat control also locks the brakes when the operator is off the seat. The power unit drive is located under the driver's seat and is readily accessible by opening a hinged cover which exposes the entire unit.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Cracking in the Throat-Sheet Knuckle

Q.—We are having considerable trouble with the throat sheets of our eight-wheel switching locomotives cracking in the knuckle. What causes these cracks and can it be remedied? Is it satisfactory to repair these cracks by welding?—M. I. T.

A.—Cracking of the throat sheet in the knuckle is generally caused by the expansion and contraction of the boiler when it is being fired up and cooled down. Rapid firing up and cooling down of the boiler exaggerates this condition and should be avoided.

The rigidity of the boiler construction at this point due to the connection between the shell, the firebox wrapper sheet and the throat sheet being in such close proximity to each other limits the free expansion of the boiler at this point setting up excessive strains in the throat sheet.

The condition can be alleviated when applying new throat sheets by increasing the radii of the knuckle and corners as far as practicable. Internal strains are often set up in the sheets when flanging and fitting the plates. Care should be taken to use proper dies and when fitting to see that the plates are properly fitted together before riveting. The expansion of the boiler is often restricted at the throat sheet by using improperly designed or too rigid expansion plates causing the knuckle of the throat sheet to carry excessive strains. The application of sliding blocks, properly lubricated, in place of the rigid expansion plates will relieve strains on the throat sheet. Cracks in the knuckle of the throat sheet can be veed out and welded provided the crack is also covered with a properly designed riveted patch.

Why Was the Smoke-box Damper Eliminated?

Q.—What is the reason for eliminating the damper in the smokebox of the modern locomotives?—M. R. K.

A.—The damper in the smokebox was used for the protection of the superheater units, by stopping the flow of hot gases through the superheater units when the throttle was closed. On the older type superheaters large flues were used which permitted high temperatures around the superheater units when the locomotive was working, the steam in the units protecting them from burning. It was, therefore, necessary to eliminate the gases surrounding the superheater units when the throttle was closed. This was the purpose of the damper. On modern power with Type E superheaters and multiple throttles, the necessity for the damper is eliminated due to the use of smaller diameter superheater flues, resulting in lower gas temperatures at the rear return bend of the units. Also with the use of multiple throttles between the superheater and the steam chest, opportunity is afforded for protecting the units by providing a flow of steam through the units when the throttle is closed, particularly to the blower.

Three Ways to Cure A Leaking Throttle

Q.—We have equipped several Pacific type locomotives with multiple throttles and find that we have trouble with leaky throttles. What causes this condition? Is it due to the expansion of the boiler? Can this condition be remedied by increasing the length of the throttle rod when the engine is hot so that the pilot cam just clears the top collar of the pilot valve?—F. I. R.

A.—A leaking throttle should not be corrected by lengthening the throttle rod when the boiler is hot, for although this change will relieve the pressure of the pilot cam against the top collar of the pilot valve, the exact reverse will be true when the boiler cools down and contracts the same distance it expanded when heated up. The same pressure which existed on the top collar of the pilot valve when the boiler was hot will now be exerted against the bottom collar of the pilot valve when the boiler is cool, setting up strains in the pilot cam and the pull-down collar of the pilot valve as well as upon the latch and teeth of the throttle quadrant.

When the movement of the pilot cam between the top and bottom collars of the pilot valve is not sufficient to take care of the expansion and contraction of the boiler, there are three ways in which the expansion can be taken care of:

First—Make an elongated slot in the throttle-rod jaw of sufficient length to take care of such additional expansion as is not taken care of in the movement of the pilot cam between the top and bottom collars of the pilot valve, the throttle-rod-jaw pin being located in the rear of the slot when the engine is cold and in the front of the slot when the engine is under full boiler pressure.

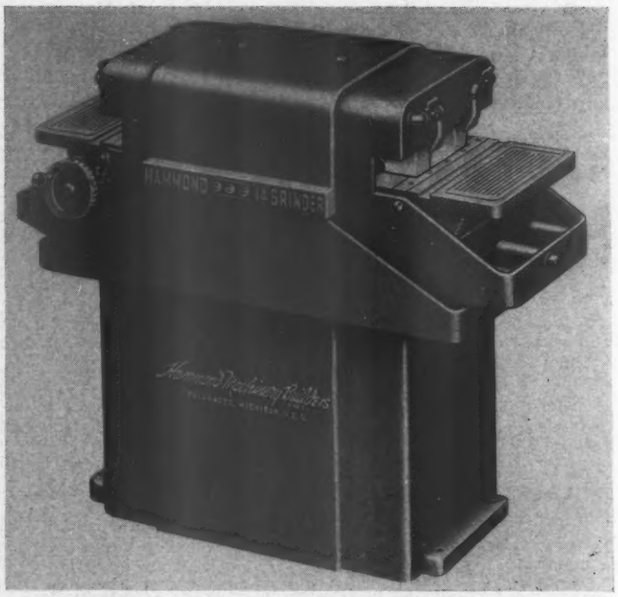
Second—Apply a compensating lever in the throttle rigging. This compensating lever is located on the side of the boiler midway between the throttle and the throttle lever, the throttle rod being made in two sections. The back section extending from the throttle lever to one end of the compensating lever, the front section extending from the throttle shaft arm to the opposite end of the compensating lever. The length of the compensating lever is made to suit individual conditions. Its advantages are that it eliminates the necessity for a continuous throttle rod with its periodical adjustments at the engine-house; eliminates all strains to the rigging due to expansion and contraction of the boiler and gives a positive opening and closing of the throttle. With the use of a compensating lever the necessity for providing for expansion in the movement of the pilot cam between the top and bottom collars of the pilot valve is eliminated and the pilot cam is provided with nominal clearance at this point, by increasing the size of the cam. Due to this smaller clearance between the pilot cam and the valve there is less slack between the throttle lever and the throttle valve tending to increase the smoother operation of the throttle in starting and stopping.

Third—The expansion and contraction of the boiler can also be taken care of by cutting away some of the teeth in the front end of the throttle lever quadrant. This arrangement eliminates the necessity of a stop on the quadrant as the valves in the throttle act as a stop.

The preferred method of compensating for expansion and contraction of the boiler is to apply a compensating lever in the throttle rigging.

Carbide Tool Grinders

Carbide tool grinders intended to give greater speed and accuracy have been developed by the Hammond Machinery Builders, Kalamazoo, Mich. These are known as the "10" and the "14." The "10" combines facilities for straight-wheel peripheral and cup-wheel face grinding; the working tables tilt from zero to 25 deg. with each degree of tilt measured on scales mounted below the tables. A protractor guide angle operates in a table slot.



Double-duty carbide tool grinder for wet or dry grinding

The "14" is available for wet or dry grinding and can be had with cup wheels on both sides, or a cup wheel on one side and a straight wheel on the other. The protractor tool gauge furnished as a part of this grinder is universal, sliding in the table slot parallel to the grinding face and having a cross slide for movement toward the wheel.

Both grinders are multi-V-belt-driven, the "10" using a one-horsepower reversing motor with a spindle speed of 2,100 r.p.m.; the "14" having a three-horsepower reversing motor with a spindle speed of 1,350 r.p.m.

Carbide tool grinder with adjustable table setting features

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Straight and Reverse Polarity

Q.—Would you explain what straight polarity and reverse polarity means as applied to welding current?

A.—Until quite recently almost all arc welding was done with the so-called straight polarity. With straight polarity the electrode is the negative side of the current and the work is the positive side. Where bare electrodes are used this is usually the case. Hard surfacing rods and manganese rail welding rods are exceptions. With the introduction of the coated rod or shielded arc process it was discovered that more speed could be developed by reversing the welding current, that is making the electrode positive and the work negative. For alter-

nating current, welding electrodes had to be developed that would weld equally well with either straight or reversed polarity because alternating current is a combination of both. Because of this the shielded arc rod produces welds of equal strength with either straight or reversed polarity.

Fabricating Hopper Car Braces

Q.—Could you suggest an economical method of fabricating, by welding, braces or spreaders for hopper cars?

A.—Hopper car braces or spreaders may be fabricated from 4-in. by 5/16-in. angle and 5/16-in. plate. The correct length of the spreader needed is determined and the angle cut, allowing 5/8 in. for the two 5/16-in. plates

Method of welding hopper car brace

at either end. The end plates may be about 4 in. by 8 in. The angle is set up on the bench and the end plates welded inside and out by the arc method. The plates are drilled and the spreader riveted in place with the apex of the angle on the upper side.

Covering Screw Heads With Solder

Q.—Could some method of welding be used to cover up unsightly screw heads in an express car door?

A.—While welding probably would not be a satisfactory method of covering screw heads in metal doors, the welding torch and solder could be used for this purpose. Clean the head of the countersunk screw and the surrounding area and swab off with cut acid. Then, with a long feather-like flame and a small welding head solder may be flowed onto these screw heads. After a little practice an operator will become so proficient that little subsequent scraping or filing will be necessary.

Emergency Oil Cups

Q.—Often we are unable to obtain suitable small oil cups for valve motion, trailer boxes and many similar places on the locomotive. In an emergency what can be used as a make-shift?

A.—A simple oil cup can be made by the welder in almost any shop. This cup should in no way replace the commercial product but is handy to have in case of an emergency. The cup part is made from 18-gage sheet iron and the threaded part is one half of a 1/4-in. by 3-in. pipe nipple. The sheet is rolled into a cone about 2 in. long with a 1 3/4 in. opening at the top, the bottom of the cone being rolled to fit the outside diameter of the pipe nipple. The cone is pushed onto the nipple. The seam in the cone and the cone itself are welded to the nipple in the same operation. Two short pieces of 1/8 in. welding wire are fastened to the top of the cone to hold the curled hair or waste.

Air Brake Questions and Answers

(AB-8, Empty and Load Equipment Continued)

102—*Q.—How can it be ascertained that the strainer is inserted properly?* A.—All nut threads will be visible.

103—*Q.—What move should follow the application of the strainer?* A.—Remove the shipping cap from the cleaned service portion, applying that portion to the pipe bracket in the same manner as the emergency portion.

104—*Q.—What precaution should be followed before applying the service portion to the bracket?* A.—Make certain that the piston is in release position.

105—*Q.—Why is this necessary?* A.—If the piston happens to project from the bushing, there is a possibility of damage to the ring and groove flange when the portion is tightened to the bracket.

106—*Q.—What precaution must be taken with respect to the shipping caps?* A.—In no case should the service or emergency portion shipping caps be removed until prepared to mount the portions on the pipe bracket.

107—*Q.—What should be done with the portions removed from the car?* A.—They must be sent to the repair shop for cleaning, lubricating and testing in accordance with standard practice.

108—*Q.—When the portions are in place and properly secured, what then should be done?* A.—Connect the release rod. Clean and blow out the dirt chamber in the dirt collector; clean the check valve; clean the gasket or renew it if necessary; then assemble the dirt collector, using a small amount of grease on the bolt threads.

109—*Q.—What part of the equipment should then be given attention?* A.—The brake cylinder. Disconnect the brake cylinder lever from both push rods.

110—*Q.—What should follow this?* A.—Remove the complete piston, rod, spring and non-pressure head assembly from both cylinders, and transport these parts to the shop for reconditioning and testing.

111—*Q.—What precaution should be taken when about to remove the piston and non-pressure head assembly from the empty cylinder?* A.—Examine the piston sleeve protector to determine whether it will hold securely in place.

112—*Q.—What procedure should be followed in dismantling the latch box and notched rod of the load cylinder?* A.—Remove the packing cup and place the assembly in a holding fixture that will clamp the piston in such a manner that the latch box can be unscrewed from the rod after the holding screws are removed and the non-pressure head is depressed against the release spring. The notched rod can then be withdrawn from the hollow piston rod with the latch box.

113—*Q.—What attention should be given the latch box parts?* A.—They must be inspected and cleaned, making certain that the latch operates freely to its locked and unlocked positions.

Reading 55-Ton Hopper Cars

Welded construction used in cars for coal handling—Design involves utilization of large cubic capacity to produce favorable weight-load ratio—Cars were built under spot system using many special tools

CONSTRUCTION of 1,500 welded hopper cars has been completed at the Reading Company's shops at Reading, Pa. The cars, of 55 tons' capacity, have a load carrying size sufficient to permit their use in bituminous coal or the anthracite trade under full axle load as established by A. A. R. limits. One thousand of the cars were placed in service on the Reading, 500 were built for the Wharton & Northern and have been leased to the Central of New Jersey. An additional 2,000 cars of the same type have been ordered on company shops for the Reading.

Welders Trained

Welded car construction was new to the working forces of the railroad, but all men required for welding on track assembly and jig operations were trained from among regular car shop employees. The men took advantage of training classes conducted before the start of the program and a sufficient force of competent welders was developed. As a result of this preliminary training, almost maximum efficiency in welding operations was insured from the start of construction of the cars. Shop welding facilities were increased through the addition of new power wiring and the locating of new outlets along the assembly tracks and at sub-assembly jig locations. Portable single-operator motor-generator sets were used for all welding.

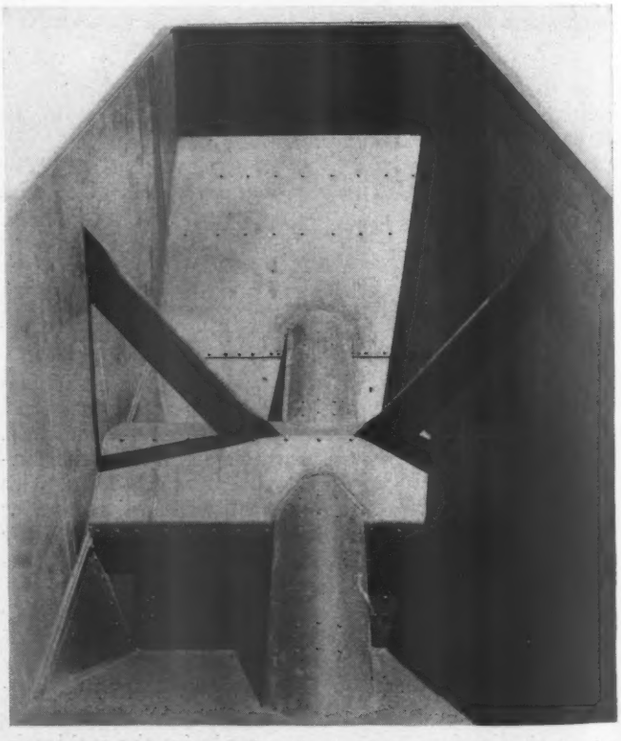
Principal Dimensions of the Reading 55-Ton Hopper Car

Inside length, ft.-in.	31—0
Coupled length, ft.-in.	35—4½
Truck centers, ft.-in.	21—4
Inside width, ft.-in.	9—9¾
Height from rail, ft.-in.	11—0¼
Capacity, level full, cu. ft.	2,028
Capacity, 10-in. heaped load at center, cu. ft.	2,280
Light weight, lb.	42,700
Ratio of pay load to gross load, per cent	74.7

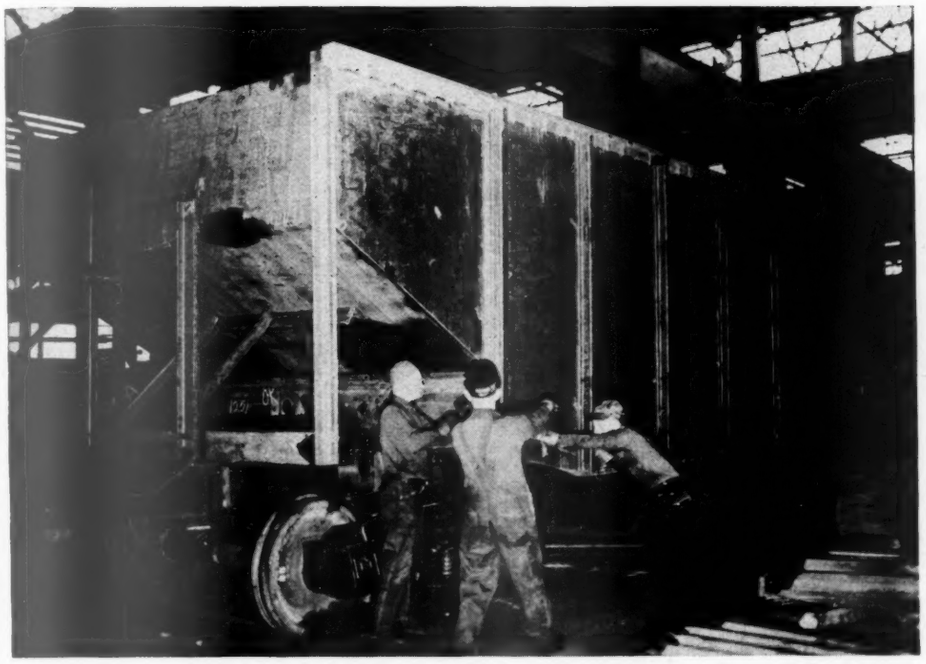
Material Handling

The storage and handling of material was left in the hands of the mechanical department except for a number of small items which were drawn from storehouse stocks as required. The placement of materials and the stocking of shop tracks was carried on as a scheduled part of the construction program and the supervisory forces of the mechanical department had complete control of the flow of needed parts to working locations. Space within the shop was used for the storage of as many of the smaller items as could be accommodated; larger parts were stored outside along lead tracks and were loaded on cars with a locomotive crane to be stocked as required within the shop.

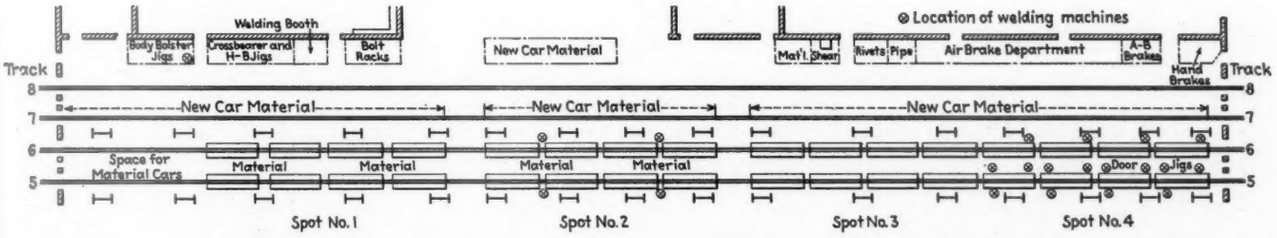
Copper-bearing steel was used in all parts of the car



Continuous end and slope floor sheet and the method of side bracing in Reading hoppers—almost all of the rivets in the car are also visible



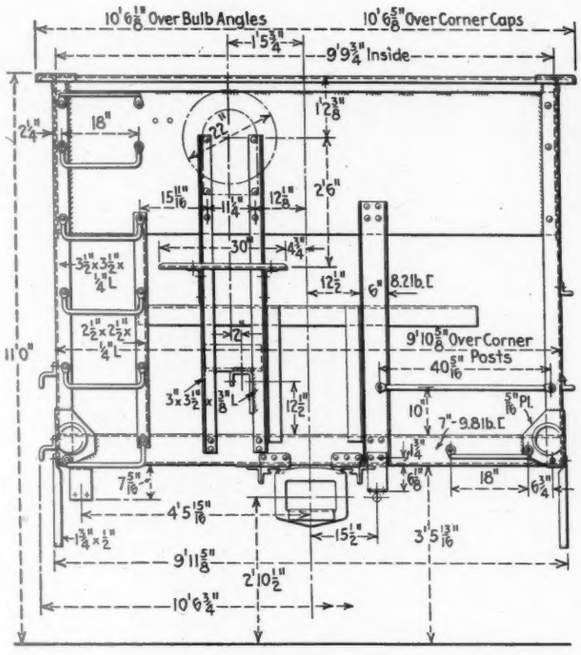
Hanging a complete car side using the safety lifting clamp applied over the side bulb angle — The clamp is locked in position before the lift is made

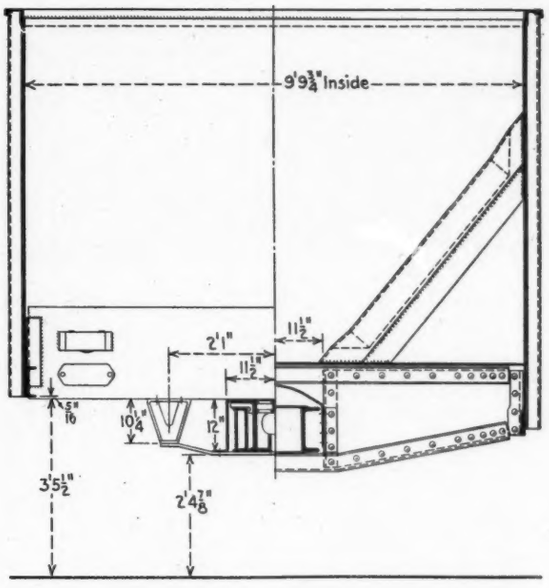


Plan view of portion of Reading car shop used in construction of 55-ton welded hopper cars—Additional material storage space outside the shop was used—Painting was done on open-air tracks after cars were moved from Spot 4

The boom attached to the hook of the overhead crane is used for placing brake reservoirs in restricted working space on welded hopper cars

Plug weld during erection
Hopper Chute
Door
3'0" Opening
Side Sheets
Journal
Filler
Weld
Coupling Line
31'0" Inside
4'10"
3'8"
3'7½"
3'4½"
5'10½"
5'6"
21'4" Truck Centers
33'1" Over Coupler Carrier Castings
31'0½" Over End Sills
4"x3½"x⅜" Bulb Angle
3"x3"x¼" L
5"x3½"x⅝" L
5"x3"x⅝" L
10"-25.3lb.C
7"-9.8lb.C
20"-95lb.I
1¾"-2.79lb.Z
4⅛"-12.5lb.Z
5"-11.6lb.Z
1'10½"
3'0⅝"
2'9"
7'3"
5'1"
5½"x10" Journal





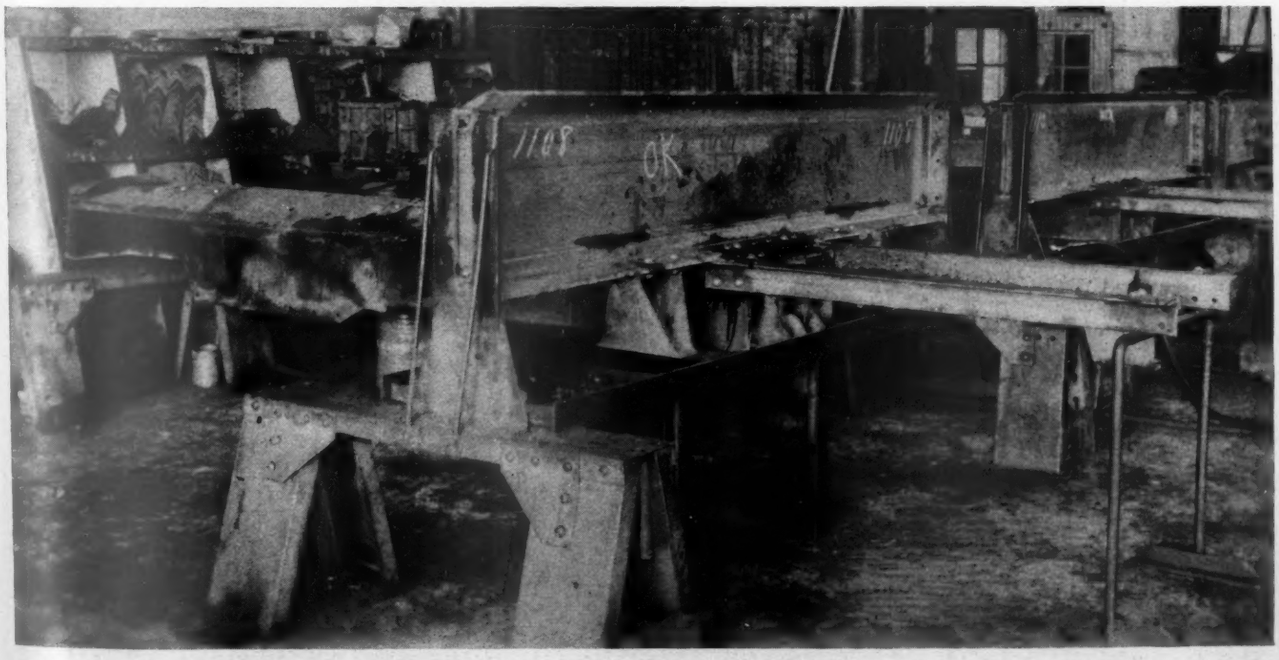
structure that come in contact with the lading. A body service life of from 18 to 20 years is expected and steel thicknesses were calculated to provide approximately equal life in all body parts. Welding is continuous wherever steel meets steel on the inside of the car and full fillet welds were made when possible. To eliminate one joint, where corrosion tends especially to shorten service life, the end and floor of the car are made of a single sheet of steel with a generous radius provided at the bend in the sheet. The body bolster is a 20-in. I-beam with the top flange bent to conform to the angle of the floor sheet. In place of cross bracing from side to side of the car, heavy formed braces are welded from the cross-ridge sheet to the car sides at a vertical angle of 45 deg.

It is anticipated that shopping of these cars for partial repairs, during their ordinary life, will not be required; when general repairs are necessary practically an all new body will be applied.

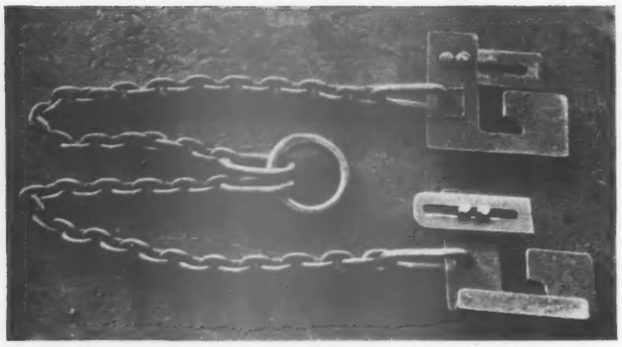
Spot System Set-up

A progressive spot system of construction was used and two production tracks were set up. Eight cars a day were completed and released to service, four cars coming off each track. Sixteen cars were under construction on each track, four cars in each of the four working locations. Full two-shift operation was required with most of the fitting up and riveting being done on the first shift and the welding on the second. Sub-assembly jigs for body bolsters were in use on both shifts, and all other sub-assemblies were built by first-trick forces.

The four working spots on each assembly track were



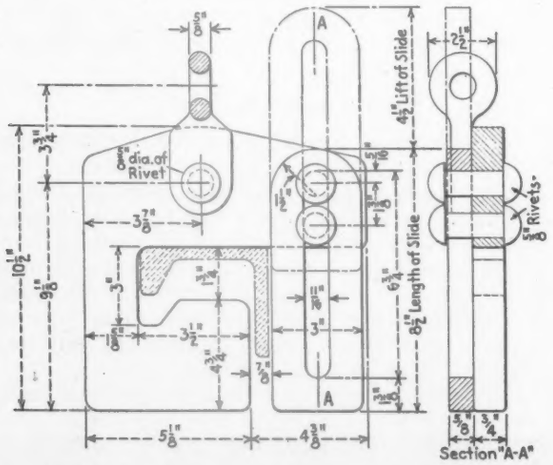
Completed body bolster assembly



Complete hopper-car sides are handled with these safety lifting clamps

filled each day with cars advanced from positions one, two and three and new cars set up in location one. In this spot, center sills were placed on testles until body bolster assemblies, cross-bearer assemblies, cross-ridge sheets, hopper chute and door frames, cross-bearer bottom ties, bolster bottom ties and body center plates had been applied. After the center plates had been riveted, trucks, previously built at another shop location, were placed under the partially completed car.

Location two was used for tack welding and other



Clamp developed at the Reading shops for safe handling of complete hopper car sides

fitting-up operations. Here the end and slope floor sheets, sides, sub side sills, end sills, end posts, end ladders, floor supports, handholds and grab irons were fitted up preparatory to riveting after the next forward movement of the cars.

Cars were moved into location three where all riveting was completed and where AB brakes furnished by the Westinghouse Air Brake Co., Ajax handbrakes, and foundation brake rigging were applied, and coupler-gear springs, coupler follower plates and couplers installed and given a preliminary gauging. All pipe work in connection with the air brakes was prepared beforehand on a quantity production basis, using pipe bending machines designed and built at the Reading Shops. No welding was done in location three.

The fourth shop assembly position was used for all finish-welding operations, completion and testing of air brake work, the application of doors and Wine door-locking mechanisms, the grinding of exterior welds and cleaning of the car body preparatory to painting.

After the completion of shop construction work four days were allowed for the painting of the cars. All painting was done on open-air tracks, which were continuous with those on which the cars were built. On the first day a coat of chromate metal primer was applied, on each of the second and third days a coat of black car paint. On the fourth day the cars were weighed, brush stenciled in accordance with the railroad's standard lettering practice, given a final inspection and released to service.

Sub-Assembly Work

Every opportunity was taken to do sub-assembly work rather than apply individual pieces of material on the cars. Major sub-assemblies were the body bolsters, cross-bearers, end-post hand-brake units, door frames and hopper chutes, door pans and hinges, door spreaders and locking dogs, and trucks. Other cases were numerous where two or more small pieces were riveted together before application.

Special Tools

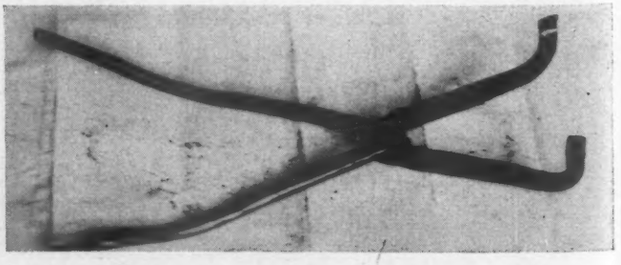
Construction of these cars involved many problems in handling materials and fitting up car parts. It was necessary for the shop supervision to develop a number of new tools, carriers and jacking devices to meet special needs. Loading and unloading of sides was accomplished by the use of a clamping device which could be slipped in place over the side bulb angle and which was locked firmly in place before a lift was made by the crane operator. Safety in the handling of complete side assemblies was insured and the sides could be held in place without danger of slippage until the fit-up gangs had secured them in position on the car. Removal of this lifting clamp required only that the safety slide be raised about 4 inches, after which the clamp was easily slipped off the bulb angle.

Application of air-brake parts was not made until the third working location on the track was reached. By this time the end sills, end posts and ladder stiles, floor sheets and sides, were in place on the car body. Only a small space between the side-ladder stile, the sub side sill and the floor sheet was open for the admission of the AB reservoir to the brackets on which it was mounted. To eliminate manual placement of this comparatively heavy and awkward piece of equipment a boom was built to be hung on the hook of an overhead crane. The crane made the lift and the reservoir was readily steered into position by the workman handling the boom.

Placing body-bolster center-brace rivets was a minor problem finally solved by making the rivet tongs illustrated. With them a firm grip could be obtained on the head of the rivet and the workman placing rivets through the center-brace casting and the flange of the body-bolster I-beam was able to do so easily because of the angle at which the jaws of the pick-up tongs were set.

Cushion-gear Underframes

In building these cars the Reading continued the use of the Duryea cushion underframe. The increased orig-



Special tongs for handling center-brace rivets

inal cost is expected to be more than recovered through the reduction in necessary replacements to conventional type draft gears, increased shock protection to the car structure and lading, and increased availability of equipment because of the reduced number of shoppings for draft-gear repairs and replacements.

Large Cubical Capacity

The principal dimensions of the cars are shown in the accompanying table. No actual weight saving is realized in these cars over the weight of the most numerous class of 55-ton riveted cars now in service on the Reading. The tare weights for the cars just completed averaged 42,700 lb., compared to 42,900 lb. for all-riveted cars of Reading ownership. But, level-load capacity of the new welded cars is 2,028 cu. ft., compared to the 1,880 cu. ft. for the older equipment, an increase in cubical capacity of 7.87 per cent.

With a 10-in. heaped load at center a capacity of 2,280 cu. ft. is obtained, so that cars of this type are available for full tonnage loads in bituminous coal or anthracite service. Reading equipment travels into producing areas for both types of fuel.

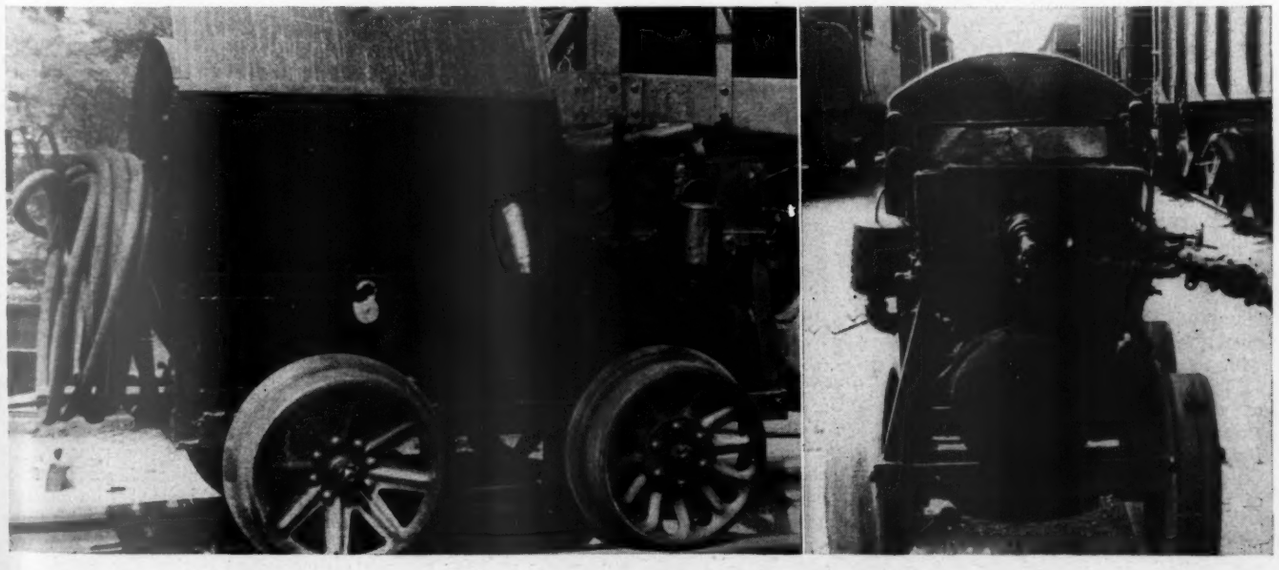
Partial List of Materials and Equipment on the Reading 55-Ton Hopper Cars

Cast-steel truck bolsters and truck sides	Birdsboro Steel Foundry & Machine Co., Reading, Pa.
Cushion-gear underframes	O. C. Duryea Corp., New York.
Uncoupling device	Standard Railway Equipment Manufacturing Co., Chicago.
A. A. R. steel axles	Bethlehem Steel Co., Johnstown, Pa.
Chilled-iron wheels	American Car and Foundry Co., Berwick, Pa. Reading Car Wheel Co., Reading, Pa.
Journal bearings	National Bearing Metals Corp., New York. Magnus Metal Corp., Chicago.
Roller side bearings	A. Stucki Co., Pittsburgh, Pa.
Journal box dust guards	Consolidated Equipment, Inc., Chicago.
AB brakes	Westinghouse Air Brake Co., Wilmerding, Pa.
Hand brakes	Ajax Hand Brake Co., Chicago.
Brake shoes; brake shoe Lockeys	American Brake Shoe & Foundry Co., New York.
Brake-beam safety guards; brake beams, A. A. R. No. 15	Chicago Railway Equipment Co., Chicago.
Brake levers	Bethlehem Steel Co., Johnstown, Pa.
Brake-hanger retainers	Illinois Railway Equipment Co., Chicago.
Brake pins	Etna Forge & Rivet Co., Etna, Pa.
Brake regulators, type K	Royal Railway Improvements Corp., Wilmington, Del.
Couplers, type E, bottom operated	National Malleable & Steel Castings Co., Cleveland, Ohio. Symington-Gould Corp., Rochester, N. Y.
Double coil truck springs	Standard Steel Works, Burnham, Pa.
Truck friction springs	Frost Railway Supply Co., Detroit, Mich.
Spring planks	Parish Pressed Steel Co., Reading, Pa.
Truck-spring plates	Motor Wheel Corp., Lansing, Mich.
Steel castings	Empire Steel Casting Co., Reading, Pa. Lebanon Steel Foundry Co., Lebanon, Pa. Reading Steel Casting Co., Reading, Pa.
Gray-iron castings	Penn Foundry Co., Reading, Pa.
Hopper door frames, hinges and latches	Wine Railway Appliance Co., Toledo, Ohio.
Bottom rod guards	Chicago Railway Equipment Co., Chicago.
Welding rod	Hollup Corp., Chicago.
Spreader rods	Schaefer Equipment Co., Pittsburgh.
Retainer pipe clamps	T-Z Railway Equipment Co., Chicago.
Retainer valve bracket	Illinois Railway Equipment Co., Chicago.
Draft-key retainers	Champion Rivet Co., Cleveland, Ohio.
Defect-card containers	MacLean-Fogg Lock Nut Co., Chicago.
Draft-key-retainer lock	Illinois Railway Equipment Co., Chicago.
Cotter lock and guard	Central Railway Supply Co., Chicago.
Chromate metal primer	Glidden Co., Reading, Pa.
Black car paint	E. I. DuPont deNemours & Co., Inc., Wilmington, Del. Pittsburgh Plate Glass Co., Pittsburgh, Pa. Sherwin-Williams Co., Philadelphia, Pa.
Stencil white paint	Glidden Co., Reading, Pa.

Riveting Service Truck

A riveting service truck, developed and used successfully at the Chesapeake & Ohio car repair tracks, Peach Creek, W. Va., is shown in the illustration. It consists of a welded-steel truck body, 60 in. long by 20 in. wide, mounted on flanged wheels which are spaced for use on 24-in. gage tracks. On the front of the truck is mounted a Hauck oil-burning rivet forge, which carries its own supply of fuel oil in a small reservoir under the furnace. The oil is vaporized and burned by air supplied through hose connection from the yard air line. The length of hose required for this air supply is supported on two hooks at the rear of the truck, the body of which is divided into six rivet bins on each side at the bottom. The upper part of the truck body on each side is devoted to locker space for air tools, small hand tools, etc. The locker space is covered by an upward-lifting hinged door which may be closed and padlocked when the tools are not in use.

The main truck frame is made of 2½-in. angles. The remainder of the truck body consists of 1½ in.-angles and thin steel sheets. The principal advantage of this truck in car-repair work is that it brings the rivet forge and all necessary tools to the job with minimum manual efforts and saves time in the riveting job itself, as no time is lost going to and from the shop for necessary tools or rivets.



The riveting service truck used at the C. & O. car-repair yard, Peach Creek, W. Va.

High Spots in

Railway Affairs . . .

Troops Transported In Pullman Cars

D. A. Crawford, president of the Pullman Company, reports that a total of 1,957,200 United States troops were transported in Pullman sleeping cars during 1941. More than 25 per cent, or about 450,000, were transported in the seven weeks following Pearl Harbor. At times as much as one-third the sleeping cars were being used for military service. The problems of assembling the cars on short notice, of handling the movements with the least interference with regular travel, and of redistributing the equipment involved many difficulties. That it was done skillfully and efficiently is indicated by the fact that the public at large hardly realized that the movements were being made.

Protection for Car Windows

Windows of London Transport trolley-buses, trains and railway cars are protected by netting. At first, small circular holes were cut in the netting to give the passenger a better view. Not satisfied, the passengers enlarged the holes by tearing the netting. The company tried cutting larger oblong openings. The passengers still continued to tamper with the nettings and the weekly repair bills were sad to contemplate. Blast tests showed that further enlargement of the holes would defeat the purpose of the netting. Diamond-shaped openings are now being used which give the passenger a wider view but afford adequate protection against blasts. The edges of the holes are treated with a plastic compound which sets hard and discourages the fabric tearers; it also makes a neater appearance.

Railway Guides Deadly

The Railway Gazette of London directs attention to "the need for the utmost co-operation of all sections of the community with the Ministry of Supply (British) in securing the salvage of every possible scrap of waste paper." It suggests that "one source of valuable waste paper may be found among out-of-date A. B. C. Railway Guides which weigh 23 oz. each, and each of which can be used for the production of four gun fuses; 10 of these books will make (wadding for?) eight airplane cannon shells." We immediately had the office boy weigh one of our American Official Railway Guides. It balanced the scale at 3 lb. 5 oz., thus being more than twice as effective for war purposes as the British Guide. For the time being, however, their old guides have the advantage of being much nearer the center of war activities.

Eugene McAuliffe Honored

Eugene McAuliffe was installed as president of the American Institute of Mining and Metallurgical Engineers on February 10. He was one of the prime movers in the organization of the International Railway Fuel Association and served as its first president in 1908-10. He made a splendid record as manager of fuel conservation, division of operation, for the Railroad Administration during and following the First World War. Mr. McAuliffe started in as an apprentice in the Northern Pacific in 1886, but early in his career became identified with the fuel departments of railways and the management of coal mining properties. For many years he has been president of the Union Pacific Coal Company and also of the Washington Union Coal Company. He has made an enviable record in mechanizing coal mining operations and in dealing with the personnel. The University of Missouri bestowed an honorary degree of Doctor of Engineering upon him in 1927.

British Railways Are Looking Ahead

The British railways, now operated under government control, are looking forward to the time when the war will be over and they will again be operated by their owners. A commission has been set up by the Railway Companies Association to consider post-war planning and reconstruction of the railways. It will be headed by Sir Ernest Lemon, vice-president of the London Midland & Scottish. He has had a long and fruitful experience in railway administration and for a while was loaned to Air Ministry as director general of production. Associated with him in the Commission are K. W. C. Grand, assistant general manager of the Great Western Railway; F. J. Wymer, assistant (planning) to the general manager of the Southern Railway; C. K. Bird, assistant divisional general manager (Southern Area) L. N. E. R.; F. A. Pope, manager of the Northern Counties Committee, L. M. S. R.; and T. E. Thomas, general manager (operation) London Passenger Transport Board. The calibre of men on the Commission augurs well for a statesmanlike and effective report.

Local Transport Problems Serious

Director of Defense Transportation Eastman is deeply concerned about local transport shortages that may be caused by increased employment, construction of new industrial plants in outlying areas, stoppage of private automobile production, restriction of civilian purchases of tires, and other factors. As a means of making the greatest use of existing facilities, Mr. Eastman suggested in a statement issued February 17 (1) staggering business, schools, and working hours, (2) improving regulation of street traffic to make possible speedier movement of passenger vehicles, and (3) making more efficient use of private automobiles through doubling up.

Railroads Amaze Ickes

On October 1 last year Harold Ickes bitterly denounced J. J. Pelley, president of the Association of American Railroads, because the latter said that there were about 20,000 idle tank cars that could be used to alleviate the oil shortage on the eastern seaboard. "I suggested to the American railroads," said Mr. Ickes, "as a test of their patriotism and as proof that they repudiate such a disservice as Mr. Pelley has committed them to, that they recall Mr. Pelley and his storm troopers from Washington and render him powerless to commit further mischievous acts." Is Harold red in the face now? Probably not, for he doesn't seem to have much of a conscience. Nevertheless Petroleum Coordinator Ickes read a statement to the oil subcommittee of the House committee on interstate and foreign commerce on February 17 which showed that by the week ended January 31 the amount of oil brought into the eastern area soared to 164,700 barrels daily, an all-time record that greatly exceeded even the peak of last October.

"We were delighted—but we hadn't seen anything yet," continued Mr. Ickes. "During the following week, the oil companies and the railroads set up a record which, I am frank to say, I had doubted was possible. They moved the amazing total of 223,000 barrels a day into the 17 eastern states. This great increase is not so much due to the number of tank cars that are being used as to the greater effiicency of their handling, both by the oil companies and by the railroads. Long hauls have taken the place of short ones; loading and unloading time have been reduced; running time has been greatly speeded up. Gentlemen, I want to take this opportunity to say that I believe that this performance warrants our highest praise, our genuine appreciation."

(Turn to next left-hand page)

In 1941 We Delivered 2,273,825 CHILLED CAR WHEELS To American and Canadian Railroads WE KEEP 'EM ROLLING!

This increase of more than 565,500* wheels over 1940 marks the *4th* successive year of steadily increasing production of new and better Chilled Car Wheels.

**Including only wheels manufactured by members of this Association.*

4 Savings with CHILLED CAR WHEELS

1. Increased Rail Life
2. Reduced Machine Shop Costs
3. Lowest Cost Per Mile
4. Increased Brake Shoe Life

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

NEWS

Beyer Granted Leave of Absence from Mediation Board

THE National Mediation Board has announced that Otto S. Beyer has been granted indefinite leave of absence so that he may give full-time service to his position as director of the Division of Transport Personnel, Office of Defense Transportation. When he announced Mr. Beyer's appointment on January 8, ODT Director Joseph B. Eastman said that he anticipated that N. M. B. would arrange to permit the appointee to serve ODT on a full-time basis.

Passenger Cars on Order

CLASS I railroads and the Pullman Company had 513 new passenger cars on order on January 1, according to the Association of American Railroads. This was an increase of 233 compared with the number on order on January 1, 1941, at which time there were 280. Of the total, Class I roads had 316 new passenger cars on order on January 1, this year, compared with 231 on the same date one year ago, and the Pullman Company had 197 on order, compared with 49 on January 1, 1941.

1941 Locomotive Shipments

LAST year's shipments of railroad locomotives totaled 970 as compared with 587 in 1940 and 356 in 1939, according to reports received by the Department of Commerce from builders other than railroad shops. The 1941 total included 182 steam locomotives, 18 electrics, 713 Diesel-electrics, and 57 of other types.

December shipments totaled 96 locomotives as compared with 89 in November and 70 in December, 1940. Unfilled orders at the end of December totaled 1,213 locomotives as compared with 1,022 on November 30, and 354 as of December 31, 1940.

Data supplied by the Car Service Division, Association of American Railroads, on locomotive building in railroad shops show that 24 locomotives (20 steam and four electrics) were thus produced in 1941 as compared with 74 (40 steam, 21 electrics, and 13 "gas or Diesel") in 1940. Railroad shops built six locomotives (four steam and two electrics) in December as compared with none in December, 1940. As of January 1, 1942, railroad shops had unfilled orders for 39 locomotives, including 21 steam and 18 electrics.

Freight-Car and Locomotive Priorities Defined

THE War Production Board has issued interpretations of three preference rating orders—P-21, P-20 and P-8—in order to define more clearly the extent to which priorities assistance is available under them.

Order P-21 covers materials for the repair and rebuilding of steam, electric or Diesel-electric locomotives; P-20 applies to materials going into the construction of locomotives specified in that order; and P-8 governs materials for the construction of railroad, industrial and mine freight cars.

Each order assigns an A-3 preference rating to deliveries of the necessary materials. Each states that the rating may be used to obtain materials entering "directly or indirectly" into the equipment covered.

In order to avoid confusion, the interpretations state that the term "directly or indirectly" does not mean that a producer or supplier can use the rating to get materials for plant expansion, improvement or maintenance. The rating can be used only for materials which will be physically incorporated in the product, or for perishable tools used up in the process of manufacture.

Milwaukee Operates Brake School on Wheels

A CABOOSE in which 13 types of hand and air brakes have been installed is being operated over the Chicago, Milwaukee, St. Paul & Pacific as a classroom for the purpose of instructing freight conductors, brakemen, switchmen, and car inspectors in the safe and proper operation of brakes. The idea for the school was conceived by L. J. Benson, assistant to the chief operating officer, as a means of reducing accidents resulting from improper hand-brake operation and to perfect instruction in the operation of the many types of brakes in service on the railroads, which instruction heretofore had been given to new men by older employees. It is estimated that proper instruction in the operation of brakes will reduce substantially the number of deaths and injuries to employees and thereby save man-hours of work during the war.

Instruction is being given in setting and releasing several types of hand brakes and in the operating principle of K and AB air brakes. Another feature of the car is a section devoted to the display of six types of fire extinguishers which are used on rolling stock and in offices and shops.

The car was fitted in the company's shops at Milwaukee, Wis. It is operating over the system, stopping from one to several days at various points to instruct switchmen and trainmen.

Barriger Joins Eastman Staff

JOHN W. BARRIGER, III, has been appointed by Director Eastman of the Office of Defense Transportation to the position of associate director of ODT's Division of Railway Transport which is headed by V. V. Boatner. Also, Mr. Eastman has announced the creation of a Division of Coastwise and Intercoastal Transport, headed by Ernst Holzborn of New Orleans, La., executive vice-president of the Atlantic Coastwise and Inland Water Carriers Association, Inc., and former assistant director of the Interstate Commerce Commission's Bureau of Water Carriers.

Instruction in proper brake operation is given in a caboose car which has been fitted with several types of brakes

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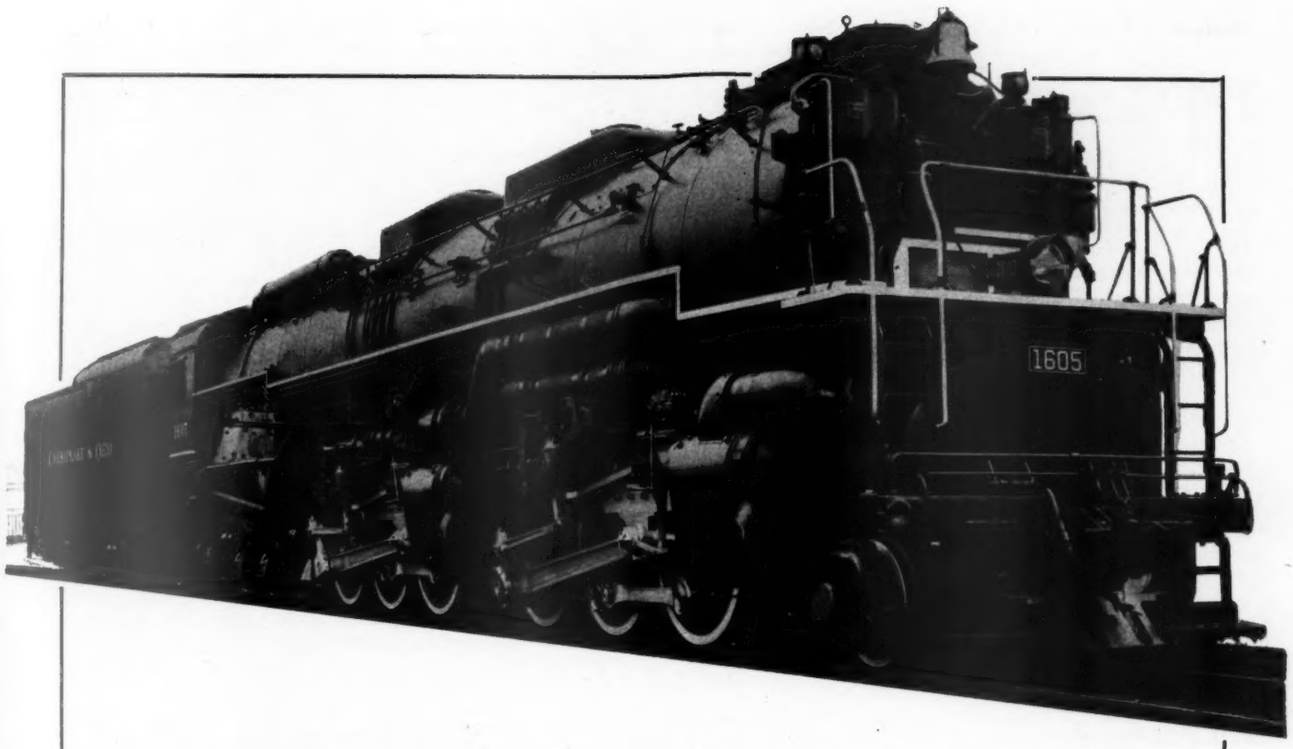


Lima-built Allegheny Type Locomotives Speed Up Freight Transportation On C AND O

Ten of these "Allegheny Type" 2-6-6-6 articulated locomotives are now being used by the Chesapeake & Ohio to speed up freight transportation. This new design of super-power steam locomotive, which was recently delivered by Lima to the C & O, is to be used to augment present power in keeping with the railroad's progressive policy of up-to-date power to stay abreast of traffic demands.

In addition to these ten locomotives now in service the Chesapeake & Ohio has placed a duplicate order for ten more 2-6-6-6 Allegheny Type locomotives that are now being built by the Lima Locomotive Works.

LIMA LOCOMOTIVE WORKS, LIMA LOCOMOTIVE WORKS INCORPORATED INCORPORATED, LIMA, OHIO

Industry Committee on Solid Fuels

SOLID Fuels Coordinator Harold I. Ickes has announced the appointment of members of an industry committee on solid fuels. The function of the committee, according to Mr. Ickes, will be to advise on the coordination of the Nation's fuel supply to meet war-time needs.

Representing railroad transportation will be J. J. Pelley, president of the Association of American Railroads, and W. C. Kendall, chairman of the Car Service Division of the A. A. R. Transportation other than railroad will be represented by Lachlan Macleay, president of the Mississippi Valley Association.

History of Koppers Subsidiary Includes Locomotive-Building

A SUBSIDIARY of Koppers Company was once in the business of building standard steam locomotives. This and other interesting facts about the Bartlett Hayward division of Koppers Company are presented in a history of the 103-year existence of the Division and predecessor companies entitled "Iron Men and Their Dogs," by F. C. Latrobe, recently issued by the Division. The Bartlett Hayward division, which now manufacture coal gas plants, in its early history as a separate company was in the general foundry business, manufacturing stoves, cast-iron building fronts, etc. In 1863 the then Hayward, Bartlett & Co. took over the Winans Locomotive Works at Baltimore, Md., which it operated until 1867 as the Baltimore Locomotive Works. During its tenure of the works, Hayward Bartlett & Co. built or rebuilt 25 steam locomotives in addition to completing three Winans locomotives already under construction.

Budd Receives Navy Pennant for Production

THE Navy "E" pennant, since 1906 the traditional award of merit in the United States Navy, was awarded to the Edward G. Budd Manufacturing Company on February 4 in the presence of Naval, company and civic officials and a large number of employees of the plant. Chief feature of the program was the presentation of a pin bearing the Bureau of Ordnance insignia and the Navy "E" to Gerard Livezey, a foreman, representative of the 10,000 Budd employees, some 4,000 of whom attended the celebration.

Award of the "E" is based upon the status of the company's production as compared to contract schedules, the amount of ingenuity shown in overcoming obstacles, the degree of corporate self-reliance, and willingness by the manufacturing company to tackle difficult tasks and give to the Navy genuine co-operation.

The Budd Company today is busy with defense work. Material for every branch of the service is rolling from the company's production lines, and some 75 per cent of the company's output is now for defense. An early conversion to 100 per cent defense work is anticipated. Among the products Budd is producing for the Navy are metal components and other devices for the Bureau of Ordnance; stacks, uptakes, doors, hatches, masts and other parts for naval vessels; and stainless steel assemblies and parts for naval aircraft.

Timken Eliminates Demurrage

THE Timken Roller Bearing Company, Canton, Ohio, is currently making a practice of holding no car over 48 hr. "It is a very easy thing to do," according to W. C. Sanders, general manager, Railway division. "We simply make the head of every department in our various plants see to it that no car, either incoming or outgoing, is retained over 48 hr. [after which demurrage begins]. We have explained to our department heads that it is desirable to load and unload the cars in less than 24 hr. or, if possible, in 1 hr., because the cars are badly needed elsewhere.

"Furthermore, freight car storage is expensive. The average box car contains about 360 sq. ft. of floor space and from 3000 to 3500 cu. ft. of capacity. At $5.50 demurrage per day, this amounts to 46 cents per sq. ft. per month. The average rental of space in common storage warehouses costs about 3 cents per sq. ft. per month. This includes a sprinkler system and heat."

A. C. L. Cars Carry Revenue Freight During Delivery

NEW freight cars ordered by the Atlantic Coast Line will be placed in service as soon as they are completed and before they are delivered to the railroad. There are no freight car builders located on A. C. L. rails and, ordinarily, when new freight car equipment is ordered, the new cars must be hauled empty over other lines. In view of the present emergency, the railroad has agreed to have its cars loaded immediately upon leaving the builders' plants, thus immediately contributing the cars to the national freight-car service pool, even though the result is that in many instances the new cars are considerably delayed in actually reaching their owner's rails. The plan was disclosed by C. McD. Davis, executive vice-president, in announcing the purchase of 2,000 freight cars, the orders for which were announced in the February issue.

Buckles in Steel Sheets Not Wider Than 48 In.

ACCORDING to a circular letter, issued February 17, by the secretary of the A. A. R. Mechanical Division, Spec. M-117-37 for carbon steel sheets and thin plates, under Sect. IV, permissible variations in weight, thickness and size, Par. 17, Table VII, limits buckles in sheets not wider than 48 in. to a maximum height of ½ in. The steel companies, under present conditions, will not agree to furnish these sheets to other than the manufacturers' standard practice, which allows ¾-in. buckles for this width of sheet.

This has caused considerable controversy and correspondence between car builders, manufacturers of steel and railroads in connecton with specifications for new freight cars.

This matter has been considered by the Committee on Car Construction and the Committee on Specifications for Materials, which are unanimously of the opinion that Spec. M-117-37 should not be modified to permit buckles higher than ½ in. in these sheets, because the specification is not made primarily for the steel industry but to establish limits which have been found desirable in car construction.

It is recommended, however, that individual purchasers relax the buckle limit in the specifications during the war period, because it devolves on all concerned to avoid any arbitrary position which might reflect on the total steel output of the mills and the total number of freight cars which may be built.

Maintenance of Automobile Loading Devices

ATTENTION has been called to an increase in damage claims on automobile shipments due to failure of hold-down chains in device cars. This is of particular importance in view of the present large shipments of army trucks and other heavy automotive equipment.

In the interest of safety and to avoid damage to lading in transit, special attention should be given to hold-down chains during inspection of device cars prior to loading to make certain that all chains and their attachments are in proper condition for use.

Where links or other parts are found worn to the extent of reducing the original cross-sectional area by 25 per cent, or otherwise defective, chains should be repaired or replaced.

The use of repair links should be discontinued, according to a circular letter, issued under date of February 16, by the secretary of the A. A. R., Mech. Div.

Equipment Purchasing and Modernization Programs

Chesapeake & Ohio.—The C. & O. has asked the Interstate Commerce Commission for authority to assume liability for $5,150,000 of equipment trust certificates, bearing interest at not more than 2½ per cent and maturing in 10 equal annual installments of $515,000 on February 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $6,544,784, and consisting of 10 class H-8-A, type 2-6-6-6 freight locomotives with 25,000 gallon tenders; 15 glass C-16-A, type 0-8-0 switching locomotives with 8,000 gallon tenders, and 1,000 50-ton, all-steel hopper cars.

Chicago & Eastern Illinois.—The C. & E. I. has asked the Interstate Commerce Commission to approve a plan whereby it would issue and sell to the Reconstruction Finance Corporation $1,200,000 of 2½ per cent equipment trust certificates maturing in 30 equal semi-annual installments of $40,000 beginning May 1, 1942, and continuing each May 1 and November 1, to and including May 1, 1957. The proceeds of the issue will be used as part of the purchase price of new equipment costing a total of $1,500,000 and consisting of 500 50-ton, 40 ft. 6 in. steel underframe box cars.

(*Continued on next left-hand page*)

Security Brick Arches

are designed

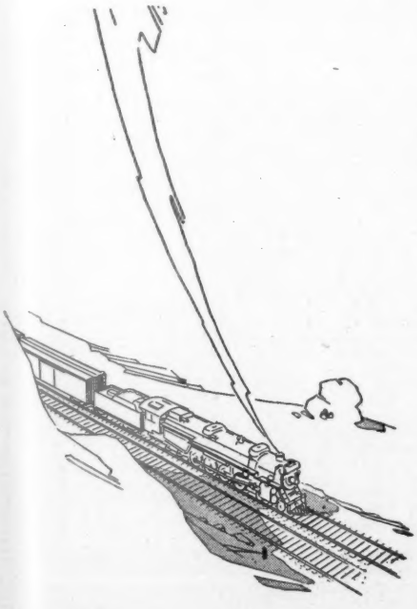
TO SAVE FUEL

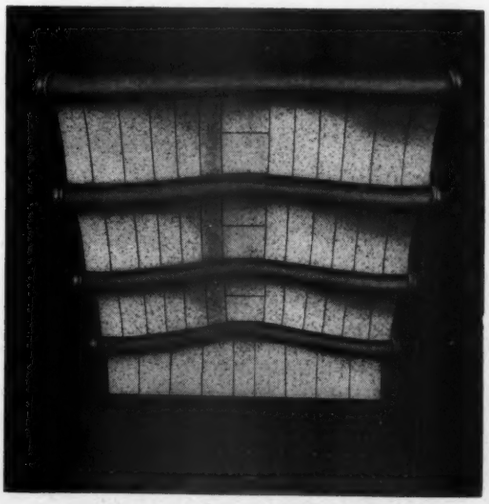
To show its full effectiveness as a fuel saver the firebox brick arch must be designed for the class of power in which it is to work.

Firebox designs are different and for full effectiveness the brick arch must be designed accordingly.

The Security Sectional Brick Arch is the result of many years of engineering and experience in locomotive operation, in studies of combustion and in the making of refractory brick.

Arch Company engineers over a period of many years have gained and applied a knowledge and experience nowhere else available. This knowledge and experience means many thousands of dollars each year in reduced fuel costs to the railroads of this country.

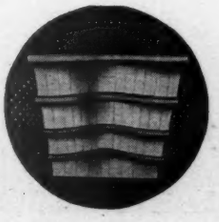




There's More to SECURITY ARCHES *Than Just Brick*

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.

Locomotive Combustion Specialists

Chicago & North Western.—The North Western has applied to the Interstate Commerce Commission for authority to assume liability for $3,750,000 of equipment trust certificates. The proceeds would be used to finance 75 per cent of a $5,079,750 expenditure for the following equipment: 500 50-ton, steel-sheathed, wood-lined box cars; 1,000 70-ton steel gondola cars with wood floors; and 250 50-ton steel flat cars with wood floors. The certificates will bear interest at a rate to be determined from competitive bids; they will be dated March 15, 1942, and will mature in 10 equal annual installments on March 15 of each year from 1943 to 1952, inclusive.

Requests for bids for equipment trust certificates aggregating $3,750,000 have also been sent out. The certificates are to cover 75 per cent of the cost of 1,750 units of freight equipment recently ordered, including 1,000 70-ton gondola cars, 500 50-ton box cars and 250 50-ton flat cars.

Colorado & Southern.—The Colorado & Southern has awarded a contract to Walter H. Harris, Denver, Colo., for the construction of a one-story addition to the enginehouse at Denver, which will be used as a machine shop.

Missouri Pacific—The district court has approved a Missouri Pacific budget for $10,653,985 for 1942. The largest item in the budget is for labor and materials for the laying of 220 miles of new rails and the relaying of 229 miles of secondary track. Among other improvements included in the budget are the conversion of passenger cars, and repairs to locomotives and freight cars.

Reading.—The Reading has been authorized by its board of directors to construct 1,000 31-ft. steel hopper coal cars of 55 tons' capacity in the company's own shops as soon as the material is available, at a total expenditure of approximately $2,500,000. The board also authorized the conversion of 50 70-ton hopper coal cars into 50 covered cement hopper cars for the handling of cement, at a cost of approximately $130,000.

St. Louis-San Francisco.—The Frisco has asked the district court for permission to purchase eight 1,000 hp. and two 600 hp. Diesel-electric switching locomotives.

St. Louis Southwestern.—The St. L. S. W. is reported to be contemplating building five steam locomotives of the 4-8-4 type.

Materials Lack Still Big Worry

THE securing of materials and equipment, the creation of storage and warehouse facilities in terminal areas, and the transportation of workers to and from work plants were cited as problems 1, 2 and 3 of transportation and the Office of Defense Transportation by Joseph B. Eastman, director of that office, at a luncheon of the Traffic Club of Chicago on February 5. The vital thing in transportation, he said, is to prevent anything that will cripple the war effort which is dependent upon it. The O. D. T., he continued, is not a second United States Railroad Administration. It was created not to drive the carriers but to lend them the help and the authority of the government for assuring the maximum utilization of transportation for the successful prosecution of the war. The Office will keep watch so as to be able to make proper recommendations to the President if necessary.

Price Ceilings on Specialties

PRICE ceilings for so-called railroad specialties—i. e., side frames, bolsters, couplers, and yokes—are fixed at levels prevailing October 1, 1941, by Amendment No. 1 to Steel Castings Price Schedule No. 41. Leon Henderson, administrator, Office of Price Administration, has announced. The new prices are listed in the amendment, effective February 3.

A ceiling based on July 15, 1941, prices originally was set for steel castings, including railroad specialties. This ceiling permitted the steel castings producers to keep a price increase which had been made to July 15, 1941, but eliminated a corresponding increase made by the railroad specialty producers after July 15, 1941. The new amendment permits the corresponding increase for the railroad specialties.

A change also was announced in steel castings. This is applicable in the case of a producer who receives an order for a particular item which he was not making on or prior to July 15, and therefore, one for which he had not filed a price. In such case, where on and after February 5, 1942, a producer makes a steel casting for which he has not previously filed a price with OPA, then such casting must be sold at a price not higher than that listed in the Steel Founders Society's Comprehensive Report for the corresponding casting. As an alternative, or in a case where the particular casting is not listed in the Comprehensive Report, the producer must obtain approval of the proposed selling price from OPA. If OPA does not act upon any such request for approval of a price within six days, the request price is deemed to be approved automatically, it was stated.

Trade practice for steel castings and railroad specialty producers, the OPA announcement said, has been to quote a firm price for a limited period. Permission is granted such producers in the new amendment to quote prices not in excess of OPA levels in effect at time of delivery, where such delivery is not to take place until six months or more after the contract of sale is entered into.

New Plan for Steel Plates

A COMPREHENSIVE plan for control over production, consumption and allocation of steel plates was outlined on February 16, at a meeting of plate producers by C. E. Adams, chief of the iron and steel branch of the division of materials, War Production Board.

The stated purpose of the new set-up is to insure fulfillment of all military re-

(*Continued on next left-hand page*)

Orders and Inquiries for New Equipment Placed Since the Closing of the February Issue

Road	No. of Locos.	Types of Locos.	Builder
LOCOMOTIVE ORDERS			
Bethlehem Steel Co.	1	25-ton Diesel-elec.	General Electric Co.
Chicago, Rock Island & Pacific	5	4,050-hp. Diesel-elec. frt.	Electro-Motive Corp.
	8	600-hp. Diesel-elec.	
	4	1,000-hp. Diesel-elec.	American Loco. Co.
Lake Champlain & Moriah	1	1,000-hp. Diesel-elec.	Electro-Motive Corp.
Nashville, Chattanooga & St. Louis	5	1,000-hp. Diesel	American Loco. Co.
New York Central[1]	25	4-8-2	Lima Loco. Wks.
	2	4,000-hp. Diesel-elec.	Electro-Motive Corp.
	10	600-hp. Diesel-elec.	
	17	660-hp. Diesel-elec.	American Loco. Co.
	3	660-hp. Diesel-elec.	Baldwin Loco. Wks.
Remington Arms Company	1	45-ton Diesel-elec.	General Electric Co.
St. Louis Southwestern	3	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
Wabash	2	1,000-hp. Diesel-elec.	American Loco. Co.
LOCOMOTIVE INQUIRIES			
Boston & Maine	5	4-8-2	.....
New York, Chicago & St. Louis	15	Steam	.....
Northern Pacific	10	4-8-4	.....
FREIGHT-CAR ORDERS			
Baltimore & Ohio	1,000[2]	50-ton hopper	Bethlehem Steel Co.
	1,000[2]	50-ton box	Gen. Amer. Trans. Corp.
Chicago & North Western	500	70-ton gondola	Bethlehem Steel Co.
	500	70-ton gondola	Gen. Amer. Trans. Corp.
	502	50-ton box	American Car & Fdry. Co.
	250	50-ton flat	Pull-Std. Car Mfg. Co.
Central of Georgia	100	50-ton box	American Car & Fdry. Co.
Delaware & Hudson	12	50-ton box	American Car & Fdry. Co.
Detroit, Toledo & Ironton	50	70-ton flat	Greenville Steel Car Co.
	70	70-ton gondolas	
Nashville, Chattanooga & St. Louis	50	50-ton covered hopper	American Car & Fdry. Co.
New York Central[1]	1,100	55-ton box	Despatch Shops, Inc.
	600	70-ton gondola	
	300	70-ton flat	
	500	55-ton hopper	
New York, Chicago & St. Louis	25	Caboose	Magor Car Corp.
Norfolk & Western	1,000	50-ton box	Ralston Steel Car Co.
Pere Marquette	250	70-ton flat	Greenville Steel Car Co.
St. Louis-San Francisco	...	Steel underframes, assembled car sides and miscel. forgings for 70 50-ton box	American Car & Fdry. Co.
Southern	2,500[3]	50-ton hopper coal	Pull.-Std. Car Mfg. Co.
FREIGHT-CAR INQUIRIES			
Chicago, Indianapolis & Louisville	500	Freight	.....
Nashville, Chattanooga & St. Louis	450	Freight	.....
Union Pacific	1,000	50-ton ballast	.....
	1,000	50-ton gondola	.....

[1] Locomotive deliveries expected to begin in August of this year. Orders for new locomotives and cars to cost approximately $14,000,000.
[2] Cost of 2,000 freight cars, $6,000,000.
[3] To cost approximately $6,500,000.

"JUST NOTICE THAT *Pyrometer*"—

"There was a discussion on *pyrometers* a little while ago and I will show you that they are *a mighty fine thing on a locomotive*. I had occasion to call an engineer's attention to the use of a pyrometer some time ago. I got on his engine and the pistons looked like a new shiny dollar, I said 'It appears that your engine is not lubricating very well.' 'No,' he said, 'she is not.' Well, we started out and I thought I would just see what would happen . . . the engineer made no attempt to blow off the boiler — the *pyrometer temperature showed about 500 degrees.* After we went a ways and I saw nobody was going to make any effort to blow out the boiler, I said, '*Just notice that pyrometer. You should have at least 640 deg. or 650 deg. temperature.* Let's blow off the boiler.' So we got the water down to where it should be carried, and at the next stop the engine showed some signs of lubrication, and at the completion of the run . . . the pistons were swimming in oil . . .

"In regard to the pyrometer, after we blew out the boiler regularly, the temperature gradually went up and *we had about 660 degrees . . .*"

—FROM PROCEEDINGS OF RAILWAY FUEL & TRAVELING ENGINEERS' ASSOCIATION

BE SURE YOUR LOCOMOTIVES ARE EQUIPPED WITH ELESCO PYROMETERS

A-1483

SUPERHEATERS • FEEDWATER HEATERS
AMERICAN THROTTLES • STEAM DRYERS
EXHAUST STEAM INJECTORS • PYROMETERS

THE SUPERHEATER COMPANY

Representative of
AMERICAN THROTTLE COMPANY, INC.
60 East 42nd Street • NEW YORK
122 S. Michigan Avenue • CHICAGO
• • •
Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

quirements, particularly those of the Navy and the Maritime Commission for ship plates. The ship program, plus necessary requirements for the Army, the construction of new war plants, the railroads and other heavy industry, leave no leeway in plate production, it was said. The WPB announcement also declared that the delivery of ship plate has lagged at times in recent months despite an increase in the overall plate production.

Under the new regulations, two forms must be filed monthly by consumers. Form PD-298 lists in detail requirements for the following month and the uses to which plates are to be put. Two copies are to be filed with the producer and one with the War Production Board, at least a month in advance. Form PD-299 must be filed by the seventh of the month and lists consumption, inventories and receipts for the month and estimated requirements for the two months following. Also, producers will report to the WPB daily, weekly, and monthly by wire as to shipments of plates, and monthly on schedules for the month following.

Only orders for plates carrying a preference rating of A-10 or higher, or those specifically allocated by the director of industry operations, may be requested, scheduled or delivered.

The announcement also notes that steel plate shipments in January were the highest in the nation's history, due largely to the conversion of strip and sheet mills to plate production. Shipments totaled 754,522 tons, as compared to 635,812 for December, 1941, the previous record.

Meanwhile, supplementary order M-1-f, which brings into one order complete allocation control over aluminum, has been issued by J. S. Knowlson, director of industry operations. It replaces orders M-1 and M-1-a. The order, according to the WPB announcement, leaves the allocation control over aluminum in substantially the form in which it now is being administered.

Supply Trade Notes

THE PACIFIC RAILWAY EQUIPMENT COMPANY, Los Angeles, Calif., has moved its offices and plant to 960 E. Sixty-first street in that city.

◆

JAMES B. HAYDEN, sales manager of the Industrial Brownhoist Corporation, Bay City, Mich., has been elected vice-president in charge of sales.

◆

THE STANDARD CAR TRUCK COMPANY, Chicago, has opened an office at 455 Paul Brown building, St. Louis, Mo., with J. C. Barber in charge.

◆

J. D. MCKNIGHT has been named assistant district manager of the Detroit, Mich., office of the Allegheny Ludlum Steel Corporation. Mr. McKnight joined the Detroit staff of Allegheny Ludlum in 1936.

◆

FRANK W. LEWIS, formerly chief mechanical engineer of the Bettendorf Company, has become associated with the Allied Railway Equipment Company of Chicago, as vice-president in charge of engineering.

◆

JAMES H. SHAFFER, formerly sales and service engineer with the Ajax Hand Brake Company, has joined the Schaefer Equipment Company as a special representative with headquarters at 2710 Koppers building, Pittsburgh, Pa.

◆

ALLIS-CHALMERS MANUFACTURING COMPANY.—*Max W. Babb,* president of the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has been elected chairman of the board, a position which has been vacant since the death of Otto H. Falk on May 21, 1940. *W. C. Buchanan,* a director and member of the executive committee, has been elected president.

◆

WHITING CORPORATION.—*Howard D. Grant* has been elected executive vice-president and chairman of the executive committee of Whiting Corporation, Harvey, Ill., and *Stevens H. Hammond,* vice-president, has been elected a member of the executive committee. Mr. Grant takes over the duties of *Gen. Thomas S. Hammond,* president, who has resigned as president and a director of the company to devote his full time to the Chicago Ordnance district staff as chairman of the executive committee. Mr. Grant also succeeds *C. Q. Wright, Jr.,* who has resigned to become naval adviser in the Contract Distribution Branch of the War Production Board in Chicago. Mr. Stevens H. Hammond will supervise all of the company's sales activities.

◆

ARTHUR T. COX, JR., has been elected vice-president of The Lincoln Electric Railway Sales Company, with headquarters at Chicago, Ill. Mr. Cox, who was born on May 5, 1911, at Indianapolis, Ind., studied engineering at Cornell and Purdue Universities and was graduated from the

Arthur T. Cox

latter in 1933. Before his appointment as vice-president of The Lincoln Electric Railway Sales Company at Chicago, Mr. Cox was sales manager of the Bettendorf Company, Bettendorf, Iowa. Prior to that he had been a district sales manager in the Industrial Sales Division of The Lincoln Electric Company, by whom he had been employed from September 16, 1936, until May 8, 1939. In his work as vice-president Mr. Cox will be in charge of welder machine and electrode sales as well as engineering service on all railroads in Chicago and territory west of Chicago.

◆

GEORGE G. PREST, who was associated for a number of years with the late George H. Goodell, railway equipment manufacturers' agent at St. Paul, Minn., has been appointed representative for the National Lock Washer Company, Newark, N. J., in Minneapolis and St. Paul.

◆

MCKENNA METALS CO.—The McKenna Metals Co., Latrobe, Pa., announces the appointment of two new sales representatives in the Eastern district, to operate under *J. A. Deakin, Sr.,* eastern sales manager, 50 Church street, New York. *R. S. Hudgins,* one of the new Kennametal representatives, will have headquarters at 965 Farmington avenue, West Hartford, Conn., and *Charles E. Washburn* will be located at 258 Park Square building, Boston, Mass.

◆

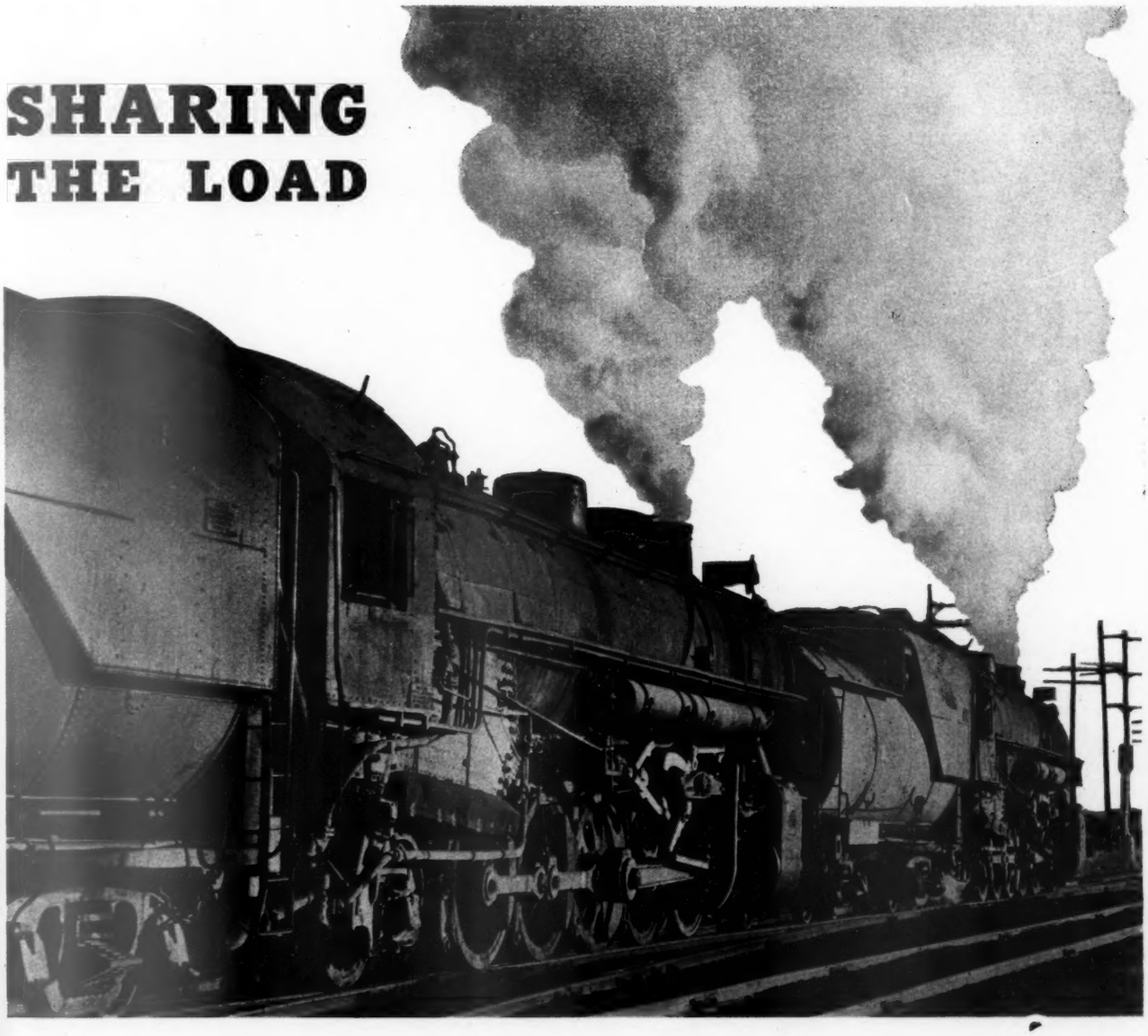
THE LANDIS MACHINE COMPANY has completed an addition to its plant at Waynesboro, Pa. The addition includes a structure of brick, concrete, and steel, 60 ft. by 350 ft., which will house a new erecting floor and shipping department. A wing, 50 ft. by 80 ft., extending from the main structure at the shipping department, will house a box and crate manufacturing department as well as a lumber storage. A second building, 30 ft. by 60 ft., one story in height, and of brick and reinforced concrete construction, is for the storage of chips and cuttings, according to their physical analysis.

◆

JONES & LAUGHLIN STEEL CORPORATION.—*John B. De Wolf* has been transferred as district sales manager of the Jones & Laughlin Steel Corporation from New York to Washington, D. C.; *S. A. Fuller* from Chicago to New York; and *Ernest W. Harwell* from Memphis, Tenn., to Chicago. *E. E. Hoehle,* formerly assistant district sales manager at Memphis, has been appointed sales manager in that city. *R. J. Woods, Jr.,* formerly sales engineer in the

(Continued on next left-hand page)

SHARING THE LOAD



THE responsibility for the cleaning of parts on the tonnage basis is no light burden — but railroad shop executives do not carry it unaided.

The practical experience and the resources of the largest producer of industrial cleaners are at their command—with Wyandotte Personal Service.

The complete removal of carbonized substances, stubborn dirt, grease and oil, requires a highly specialized cleaner — engineered for speed and economy.

Wyandotte Metal Cleaners are highly effective in railroad work — and economical. Railroad shop records in all parts of the country show that Wyandotte solutions "stand up" to heavy-duty cleaning, and require but little new material for replenishment. Also — their use permits only a very low percentage of rejects.

May we co-operate with you?

Wyandotte
PRODUCTS
SERVICE REPRESENTATIVES IN 88 CITIES

THE J. B. FORD SALES COMPANY, WYANDOTTE, MICHIGAN

Memphis office, has been appointed district sales manager in the company's new district sales office at Tulsa, Okla.

◆

JOHN W. SHEFFER, who has been associated with the American Car and Foundry Company since 1908, has recently been

J. W. Sheffer

appointed general electrical engineer of that company. Mr. Sheffer graduated from Cornell University in 1907 with a degree in mechanical engineering and later, in 1933, obtained his Master of Arts degree from Columbia University. He began his association with the American Car and Foundry Company in 1908 at the Berwick, Pa., plant, acting first as electrical engineer and later in the capacities of assistant to the general superintendent and plant engineer. During these 17 yars he was engaged also with welding developments of all description, and was particularly responsible for the development of the Berwick electric rivet heater. In 1926, he was transferred to the New York office and since that time has been occupied with improvement and development problems in the several plants. Major welding installations have been made at five plants of a. c. f. and its affiliates. Mr. Sheffer holds memberships in the American Institute of Electrical Engineers, American Welding Society, Iron and Steel Engineers and Cornwell Society of Engineers.

◆

A. H. BOND has been appointed Co-ordinator of War Industries Work of Oakite Products, Inc. Through Mr. Bond, whose headquarters will be at 757 North Broadway, Milwaukee, Wis., information on developments in production cleaning and related manufacturing operations essential to the manufacture of artillery, tanks, airplanes, etc., will be made available to various government officers and manufacturing executives in Washington and key production centers throughout the United States.

Obituary

FLOYD K. MAYS, vice-president of the Peerless Equipment Company, Chicago, died in that city on January 23. Mr. Mays was born in Richmond, Va., in December, 1886, and entered railway service with the Atlanta, Birmingham & Atlantic (now the A. B. & C.). In 1913 he was promoted to treasurer and purchasing agent at Atlanta, Ga., and in 1916, was appointed also secretary. In 1918, Mr. Mays was made assistant to the federal manager and purchasing agent, and in 1920, resigned to enter the employ of the Bradford Draft Gear Company. He remained with this company until July, 1932, when he was elected president of the newly formed Peerless Equipment Company, New York. When this company was purchased by Poor & Co., in 1936, he was elected vice-president at Chicago.

GEORGE H. GOODELL, railway equipment manufacturers' agent, died on December 27, 1941, in St. Paul, Minn. He was 71 years of age. Mr. Goodell, a graduate of the Massachusetts Institute of Technology, began his business career in 1893 as a special apprentice in the Grant Locomotive Works at Chicago and continued in that capacity

George H. Goodell

in 1893 and 1894 with the Baldwin Locomotive Works at Philadelphia, Pa. From 1894 to 1899 he served first as engineer of tests and then as mechanical engineer with the Erie at Susquehanna, Pa., and from 1899 to 1901 as mechanical engineer with the Northern Pacific at St. Paul, Minn. In 1901 and 1902 he was assistant chief engineer and chief engineer, respectively, of the Pressed Steel Car Company, Pittsburgh, Pa., and in 1902 and 1903 assistant to the president and chief engineer of the Standard Steel Car Company, Pittsburgh, Pa. From 1903 to 1928 he was a partner in the firm of Rank & Goodell in St. Paul, Minn., and from 1928 to 1937 senior partner of Goodell & Hoppe in that city. Since May, 1937, he had been active as a railway equipment manufacturers' agent in St. Paul.

Personal Mention

General

D. M. VANCE has been appointed mechanical inspector on the Texas & Pacific, with headquarters at Dallas, Tex.

M. J. YOUNG, assistant master mechanic on the Texas & Pacific at Ft. Worth, Tex., has been appointed general locomotive inspector, with headquarters at Dallas, Tex.

A. B. WELCH, supervisor of lubrication and valve pilot operation of the Texas & Pacific, has been appointed supervisor maintenance of equipment, with headquarters as before at Dallas, Tex. The positions of supervisor of lubrication and valve pilot operation and equipment maintenance supervisor have been abolished.

HARRY L. NANCARROW, general superintendent of the Lake division of the Pennsylvania at Cleveland, Ohio, has been appointed general manager of the Western region, with headquarters at Chicago. Mr. Nancarrow was born at Jersey Shore, Pa., on January 13, 1897, and graduated in mechanical engineering from Bucknell University in 1920. He entered railroad service on October 7, 1920, as draftsman in the office of the superintendent of motive power of the Pennsylvania at Philadelphia, Pa. On March 21, 1921, he was appointed a special apprentice at the Altoona machine shops, becoming inspector of motive power there on April 17, 1924. He was appointed gang foreman on the Cleveland division on September 1, 1924, and assistant enginehouse foreman on February 10, 1926. On March 1, 1927, he became assistant master mechanic on the Akron division, being promoted to master mechanic of the Erie & Ashtabula division on May 16, 1928. On January 1, 1929, he was transferred to the Baltimore division and then to the Philadelphia Terminal division. On September 16, 1936, he became superintendent of the Logansport division, being transferred to the Buffalo division on January 16, 1938. He became superintendent of passenger transportation

Harry L. Nancarrow

of the Eastern Region at Philadelphia, on May 1, 1939, and was appointed superintendent of the Pittsburgh division at Pittsburgh, Pa., on January 16, 1940. Mr. Nancarrow was promoted to the position of general superintendent of the Lake division on February 1, 1941.

H. M. Wood, master mechanic of the Pittsburgh, Conemaugh and Monongahela divisions of the Pennsylvania, has been appointed superintendent of the Logansport

H. M. Wood

division, with headquarters at Logansport, Ind. Mr. Wood was born in Altoona, Pa., on June 4, 1901, and was educated at Pennsylvania State College. He entered railway service as a clerk in the Altoona machine shop of the Pennsylvania on July 7, 1919. He became a machinist apprentice on June 15, 1922, a special apprentice in 1925, and motive-power inspector in 1927. In 1930 he went to Harrisburg, Pa., as a gang foreman and five years later became assistant foreman at Enola yard, Harrisburg. He became assistant master mechanic on the Pittsburgh division in 1936, and master mechanic of the Long Island Railroad on August 1, 1937. He returned to the Pittsburgh division of the Pennsylvania as acting master mechanic on May 16, 1941, and on December 1, 1941, was appointed master mechanic of the Western Pennsylvania general division, consisting of the Pittsburgh, Conemaugh and Monongahela divisions.

Walter O. Teufel, superintendent of the St. Louis division of the Pennsylvania at Terre Haute, Ind., has been promoted to general superintendent of the Southwestern division, with headquarters at Indianapolis, Ind. Mr. Teufel was born at Milton, Pa., on July 30, 1897, and attended Pennsylvania State College. He entered railway service on April 10, 1916, as an apprentice in the mechanical department of the Pennsylvania. On October 1, 1922, he was appointed motive-power inspector and on February 15, 1926, was promoted to assistant master mechanic at Wilmington, Del. Mr. Teufel was transferred to Altoona, Pa., on March 1, 1930, and on January 1, 1931, became master mechanic at New Castle, Pa. On May 1, 1932, he was appointed assistant master mechanic at New York and on November 1, 1933 became master mechanic at Buffalo, N Y. Mr. Teufel was later transferred to Pittsburgh, Pa., and Columbus, Ohio, and in July, 1939, he was promoted to the position of super-

Walter O. Teufel

intendent of the Indianapolis division, with headquarters at Indianapolis, Ind. In November, 1940, he was transferred to the St. Louis division, with headquarters at Terre Haute.

Alexander K. Galloway, superintendent of motive power and rolling equipment on the Reading at Reading, Pa., who has been appointed general superintendent of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., as announced in the January issue of the *Railway Mechanical Engineer,* was born at St. Thomas, Ont., Canada, on October 1,

A. K. Galloway

1885. He entered railway service on June 1, 1902, as a machinist apprentice in the employ of the Michigan Central, becoming a machinist on June 1, 1906. He then served successively as enginehouse foreman and general foreman. On November 1, 1914, Mr. Galloway went with the Baltimore & Ohio as acting master mechanic of the Baltimore division, becoming master mechanic on July 1, 1915, and general master mechanic at Cincinnati, Ohio, on July 20, 1916. On February 1, 1917, he was appointed district master mechanic at Baltimore, and in April, 1927, superintendent motive power. He became superintendent motive power and rolling equipment of the Reading and Central of New Jersey in November, 1936.

W. B. Whitsitt, assistant chief of motive power and equipment on the Baltimore & Ohio, has been appointed chief engineer of motive power and equipment, in charge of research, design, standards and new construction, as noted in the January issue of the *Railway Mechanical Engineer.* Mr. Whitsitt was born on May 27, 1883, and entered railway service on March 16, 1903, as draftsman in the motive power de-

W. B. Whitsitt

partment of the Baltimore & Ohio at Newark, Ohio, later being transferred to the Mount Clare shops at Baltimore. On October 1, 1915, Mr. Whitsitt became apprentice instructor, Mount Clare shops; on September 1, 1917, assistant chief draftsman and chief draftsman on July 16, 1918. On October 1, 1922, he was appointed assistant mechanical engineer; on November 1, 1926 mechanical engineer, and in June, 1937, assistant chief of motive power and equipment at Baltimore.

Fred S. DeVeny, superintendent of the Baltimore & Ohio, Chicago Terminal, with headquarters at Chicago, has retired. Mr. DeVeny was born at Bourbon, Ind., on October 7, 1875, and, after attending college, entered railway service in September, 1894, as a car inspector on the Baltimore & Ohio. A year later he became a locomotive fireman and, in 1901, was promoted to locomotive engineer. In 1908 he became road foreman of engines and in May, 1920, was promoted to trainmaster of the B. & O., Chicago Terminal. Mr. DeVeny was promoted to superintendent on May 1, 1921.

H. C. Wyatt, superintendent of the Pocahontas division of the Norfolk & Western, at Bluefield, W. Va., has been appointed assistant general superintendent of motive power, with headquarters at Roanoke, Va. Mr. Wyatt started working for the Norfolk & Western during school vacation periods, and in June, 1924, was regularly employed as a special apprentice in the Roanoke shops. Since that time he has served as shop inspector at Roanoke and Bluefield, special apprentice at Portsmouth, Ohio; assistant foreman and foreman at Iaeger, W. Va.; assistant road foreman of engines, and general foreman at Columbus, Ohio. He was promoted to assistant master mechanic of the Radford and Shenandoah divisions in August, 1937.

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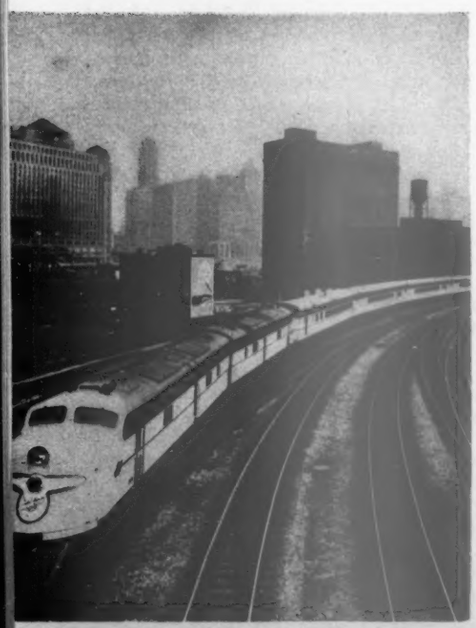
Transportation—the Backbone of the Nation

Who Serves the Railroad



Meeting the Challenge

AMERICAN railroads are today faced with the greatest transportation responsibility in our nation's history, that of moving the fast growing army of men, materials and supplies with safety and dispatch.

In meeting this challenge, General Motors Diesel locomotives in all classes of service are playing an important part, not only in promoting the conservation of vital war materials, such as metals and fuel, but many other operating advantages and economies. In this program the GM 5400 Hp. Diesel freight locomotives are particularly outstanding as evidenced by their ability to:

(a) Effect savings in train miles as much as 50 per cent, making one Diesel train mile the equivalent of two steam train miles.

(b) Release for other important service as many as five heavy steam locomotives for each Diesel locomotive operated.

(c) Increase the traffic hauling and time capacity; also availability for service.

(d) Provide faster schedules by eliminating many service delays now required for steam locomotives.

(e) Increase carrying capacity of existing track facilities without expensive rail replacements and rebuilding of bridge structures . . . this due to even weight distribution and low axle load of Diesels.

ELECTRO-MOTIVE
GENERAL MOTORS CORPORATION

roads—SERVES AMERICA

Conservation of War Materials

THE CONSERVATION of vital and strategic war materials made possible by the construction of Diesels instead of steam locomotives is clearly shown in the following comparisons:

(a) **192 TONS** of materials in the form of two 600 Hp. Diesel switchers will do the work of **420 TONS** of such materials in the form of three 6-wheel steam switchers.

(b) **240 TONS** of materials in the form of two 1000 Hp. Diesel switchers will do the work of **495 TONS** of such materials in the form of three 8-wheel steam switchers.

(c) **585 TONS** of materials in the form of two 4000 Hp. Diesel passenger locomotives will do the work of **1250 TONS** of such materials in the form of five modern steam passenger locomotives.

(d) **415 TONS** of materials in the form of one 5400 Hp. Diesel freight locomotive will generally do the work of **1200 TONS** of such materials in the form of four 4-8-4 modern steam freight locomotives, or **900 TONS** in the form of two Mallet steam locomotives.

MODERNIZE TO MOBILIZE WITH GM DIESELS

OTIVE DIVISION

LA GRANGE, ILLINOIS, U.S.A.

and two years later became superintendent of the Shenandoah division. In December,

H. C. Wyatt

1940, he was transferred to the Scioto division and on January 1, 1942, was transferred to the Pocahontas division.

F. H. EINWAECHTER, JR., assistant engineer in the locomotive department of the Baltimore & Ohio, who has been appointed

F. H. Einwaechter, Jr.

mechanical engineer at Baltimore, Md., as announced in the January issue of the *Railway Mechanical Engineer*, entered the service of the Baltimore & Ohio as an apprentice in 1913. In 1917, he was promoted to draftsman and in July, 1923, became leading draftsman. Mr. Einwaechter was appointed assistant engineer at the Mount Clare shops in June, 1927, and assistant engineer in the locomotive department in June, 1937.

Master Mechanics and Road Foremen

W. F. ELY, engineman, New York division of the Pennsylvania, has become road foreman of engines, Maryland division.

C. J. SEARS, road foreman, Chicago terminal division of the Pennsylvania, has been appointed road foreman of engines, Columbus division, with headquarters at Columbus, Ohio.

H. H. JONES, master mechanic on the Union Pacific at Los Angeles, Calif., has been transferred to Cheyenne, Wyo.

E. POOL, returning to duty following a period of illness, has been appointed master mechanic of the Erie at Hornell, N. Y.

F. J. MACOFEE, road foreman of engines on the Delaware, Lackawanna & Western at East Buffalo, N. Y., has been transferred to Scranton, Pa.

WILLIAM C. STURM has been appointed road foreman of engines on the Delaware, Lackawanna & Western, with headquarters at East Buffalo, N. Y.

B. H. DAVIS, road foreman of engines on the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa., has retired on pension.

H. L. CONNER, traveling fireman on the New York, Chicago & St. Louis, has been appointed assistant road foreman of engines, with headquarters at Frankfort, Ind.

J. W. MARTIN, general foreman on the Illinois Central at Waterloo, Ia., has been appointed assistant master mechanic at Markham (Chicago), Ill.

M. A. QUINN, master mechanic on the Delaware, Lackawanna & Western, with headquarters at East Buffalo, N. Y., has resigned.

ADAM TAYLOR, fireman instructor, Philadelphia division of the Pennsylvania, has become assistant road foreman of engines of the Long Island Railroad.

E. A. MCCLAIN, assistant road foreman of engines, Philadelphia Terminal division of the Pennsylvania, has become assistant road foreman of engines, New York division.

T. M. CONNIFF, general foreman in the motive power department of the Delaware, Lackawanna & Western at Scranton, Pa., has been appointed master mechanic at East Buffalo, N. Y.

E. K. SHAMBLEN, special duty engineman, Toledo division of the Pennsylvania, has become assistant road foreman of engines, Columbus division, with headquarters at Columbus, Ohio.

W. A. SHIELDS, assistant road foreman of engines, Columbus division of the Pennsylvania, has been appointed road foreman of Engines, Chicago Terminal division, with headquarters at Chicago.

W. L. JONES, master mechanic on the Illinois Central at Champaign, Ill., who has been transferred to Jackson, Tenn., as noted on page 42 of the January, 1942, issue of the *Railway Mechanical Engineer*, was born on October 6, 1894, at Cairo, Ill. Mr. Jones entered railway service with the Illinois Central on August 1, 1907, as a machinist apprentice at Cairo. He completed his apprenticeship on August 1, 1911, and until April, 1925, served successively as a machinist on the Illinois Central at Jackson, Tenn.; on the Alabama Great Southern at Birmingham, Ala.; on the Mobile & Ohio at Meridian, Miss.; and on the Southern at Sheffield, Ala. From April, 1925, to April, 1933, he was division air brake foreman at Jackson, with the exception of the period from September, 1929, to June, 1930, when he acted as assistant general air brake engineer on the Illinois Central at Chicago. In April, 1933, he was promoted to general foreman on the Illinois Central at Paducah, Ky., and in May, 1937, was transferred to the position of general foreman at Centralia, Ill. In November, 1939, he was appointed

W. L. Jones

acting master mechanic at Champaign and in July, 1940, became master mechanic at Champaign.

D. L. MCMILLAN, assistant master mechanic at the Markham (Chicago) yard of the Illinois Central, who has been appointed master mechanic at Champaign, Ill., as noted on page 90 of the February issue of the *Railway Mechanical Engineer*, was born on August 23, 1889, at Water Valley,

D. L. McMillan

Miss. Mr. McMillan attended Water Valley public school and high school and in July, 1906, entered railway service with the Illinois Central as machinist apprentice at Water Valley. From 1910 to 1916, he was a machinist at Water Valley and in 1917 became enginehouse foreman at McComb, Miss. He served with the U. S. Army at home and in France from 1917 to 1918, and in July, 1919, was appointed enginehouse foreman of the Illinois Central at Vicksburg, Miss. In August, 1926, Mr. McMillan became general foreman at McComb and in July, 1939, was appointed assistant master mechanic at Markham.

Shop and Enginehouse

JOHN HUGHES has been appointed enginehouse foreman of the New York, Chicago & St. Louis, with headquarters at Lima, Ohio.

A. H. ADANG has been appointed general foreman at the Conneaut, Ohio, shops of the New York, Chicago & St. Louis.

CHARLES F. KLEIN, night enginehouse foreman on the Delaware, Lackawanna & Western at Elmira, N. Y., has become enginehouse foreman at Elmira.

J. J. NELSON, boiler foreman on the Delaware, Lackawanna & Western at East Buffalo, N. Y., has been appointed enginehouse foreman, with headquarters at East Buffalo.

J. C. MILLER, general and erecting foreman of the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed superintendent of shops, with headquarters at Conneaut.

M. O'MEARA, assistant foreman on the Delaware, Lackawanna & Western, at Scranton, Pa., has been promoted to enginehouse foreman, with headquarters at East Binghamton, N. Y.

J. J. MCHALE, enginehouse foreman on the Delaware, Lackawanna & Western, at Kingston, Pa., has been appointed general foreman, locomotive department, with headquarters at Scranton, Pa.

Car Department

J. G. BOURGEOIS, has been appointed acting car foreman, on the Canadian National at Riviere du Loup, Que.

W. T. MADDEN, district car foreman on the Canadian National at Moncton, N. B., has retired.

A. G. CREMEAN has become general car foreman of the New York, Chicago & St. Louis at Frankfort, Ind.

J. E. RICHARD, car foreman on the Canadian National at Riviere du Loup, Que., has been appointed district car foreman, with headquarters at Moncton, N. B.

FRANK H. BECHERER, assistant superintendent of motive power and rolling equipment of the Central of New Jersey at

Frank H. Becherer

Elizabethport, N. J., has been appointed superintendent of the car department of the Baltimore & Ohio at Baltimore, Md., as noted on page 90 of the February issue.

Mr. Becherer was born at New York on August 23, 1882, and entered railway service in 1901 as billing clerk in the office of the master car builder of the Erie, subsequently becoming chief clerk in its car division. From 1907 until 1918 he served in various positions in the car department of the Pennsylvania and in 1919 became junior inspector of car equipment. During 1919 and 1922 he was senior mechanical engineer, Bureau of Valuation, Interstate Commerce Commission. In 1923, Mr. Becherer went with the Boston & Maine as mechanical inspector and was promoted to assistant to mechanical superintendent in 1925. He joined the Central of New Jersey in 1926 as superintendent car department and in 1930 was appointed assistant superintendent motive power and rolling equipment.

Purchasing and Stores

CLIFFORD G. ALLEN has been appointed purchasing agent of the Akron, Canton & Youngstown and the Northern Ohio, with headquarters at Akron, Ohio, succeeding R. A. McKinnon, who has resigned.

N. C. JOHNSON has been appointed acting purchasing agent of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., succeeding J. M. Paulus.

A. W. HIX, assistant general purchasing agent of the Chesapeake & Ohio, the New York, Chicago & St. Louis (Nickel Plate) and the Pere Marquette, with headquarters at Cleveland, Ohio, has been promoted to acting general purchasing agent, with the same headquarters, succeeding Richard M. Nelson, who has been granted a leave of absence because of ill health.

E. J. LAMNECK, purchasing agent of the Pennsylvania, has been appointed general purchasing agent, with headquarters

E. J. Lamneck

at Philadelphia, Pa. Mr. Lamneck was born in Ohio on June 27, 1887, and entered railroad service in 1907 as a truck builder on the Pittsburgh, Cincinnati, Chicago & St. Louis (now P. R. R.) at Scully, Pa. He was appointed to a clerkship in 1910 and later transferred to the purchasing department. In 1921 he was advanced to assistant to the purchasing agent of the Central region and upon consolidation of the purchasing department forces in Philadelphia in 1924 he became assistant to the purchasing agent for the system. In 1929 he was appointed fuel purchasing agent and in 1934 he was promoted to purchasing agent.

Obituary

ROY M. WILSON, general foreman of the Erie at Port Jervis, N. Y., died on January 15.

BENJAMIN DUPONT, a retired master mechanic of the Louisville & Nashville, died at New Orleans, La., on February 14.

HILLMAN H. HARVEY, who retired on November 1, 1938, as general car foreman of the Chicago, Burlington & Quincy, with headquarters at Chicago, died at his home in that city on February 1.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"BRAKE SHOE AT WAR."—The American Brake Shoe and Foundry Company, 230 Park avenue, New York. Twelve-page booklet reports on the company's role in producing materials of war in its 58 plants. Many illustrations.

◆

PORTABLE ELECTRIC TOOLS.—Independent Pneumatic Tool Company, 600 W. Jackson boulevard, Chicago. Sixty-four-page catalogue (No. 37) of 1942 line of Thor portable electric tools.

◆

MACHINE CUTTING TIP.—Air Reduction Sales Company, 60 East Forty-second street, New York. Eight-page illustrated booklet, ADC-631, describes the new Airco "45" high-speed machine cutting tip, with performance facts and figures in text and chart form.

◆

CARE AND CLEANING OF HANDS AND ARMS.—Magnus Chemical Co., Inc., Garwood, N. J. Twenty-four-page Technical Bulletin No. 51 entitled "The Care and Cleaning of Hands and Arms in the Industrial Plant."

◆

"DRILL AND REAMER FACTS.—Whitman & Barnes, 2108 West Fort street, Detroit, Mich. Thirty-two-page booklet in two sections: Drill Facts, describes and illustrates design and construction of twist drills; correct drill pointing, etc.; Reamer Facts contains a short treatise on design, construction, use and care of reamers, etc.

◆

WOODWORKING MACHINES.—De Walt Products Corporation, Lancaster, Pa. Twenty-page booklet illustrates and briefly describes De Walt wood-cutting machines and operations.

◆

ELECTRIC STRAIN GAGES.—General Electric Company, Schenectady, N. Y. Eight-page booklet (GEA-3673) describes and illustrates different types of gages for measuring mechanical strains, and discusses their operation.

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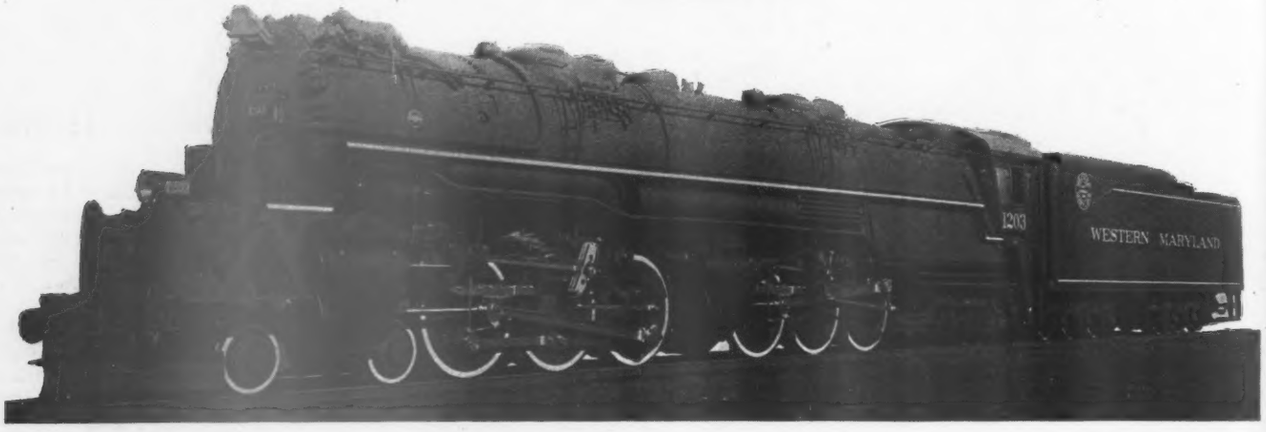

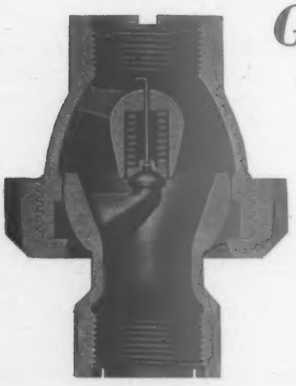

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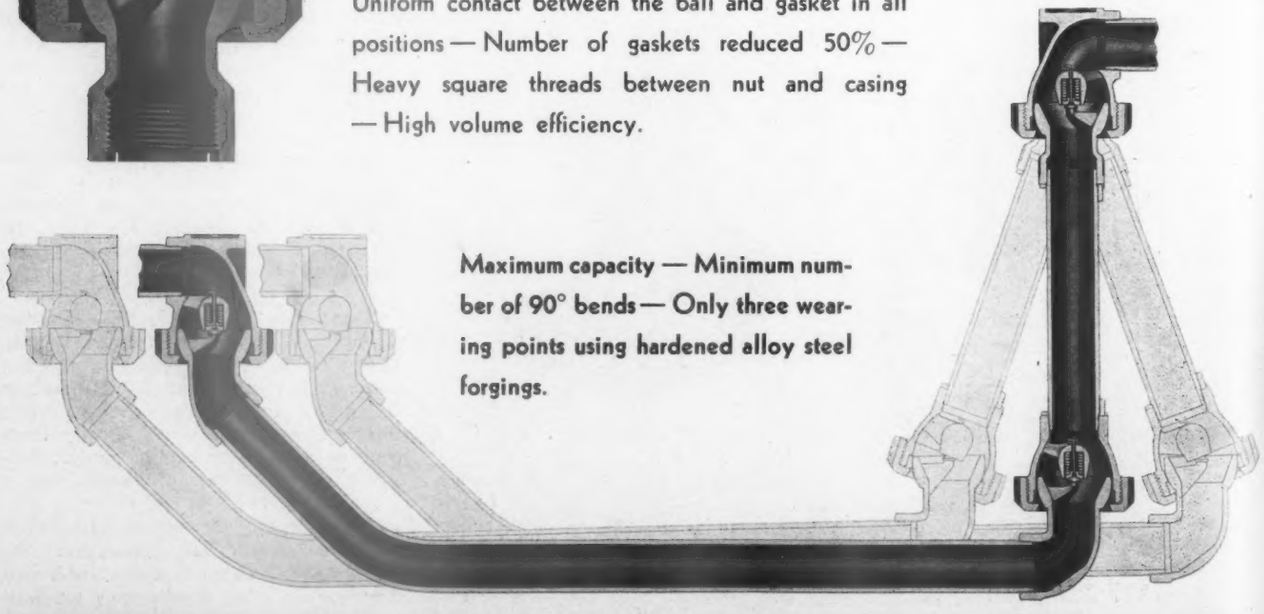

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